UNITED STATES DISTRICT COURT
DISTRICT OF NEW JERSEY

SAMUEL L. KAPLAN, on behalf of himself and the Putative Class, **Plaintiffs,** **v.** **GENERAL ELECTRIC COMPANY d/b/a GE, UNITED TECHNOLOGIES CORP., UTC FIRE & SECURITY AMERICAS CORPORATION, INC. d/b/a INTERLOGIX and CARRIER GLOBAL CORPORATION,** **Defendants.**	**Case No.:** **Civil Action** **CLASS ACTION COMPLAINT AND JURY DEMAND**

Plaintiff, by his attorneys Nagel Rice, LLP and Poulos LoPiccolo PC, on behalf of himself and all others similarly situated nationwide, brings this Class Action Complaint against Defendants General Electric Company, d/b/a GE, United Technologies Corp., UTC Fire & Security Americas Corporation, Inc. d/b/a Interlogix and Carrier Global Corporation (herein "Defendants"), and alleges as follows:

PARTIES

1. Plaintiff, who is a disabled veteran, is a citizen of the State of New Jersey as well as a United States citizen. He resides in Teaneck, New Jersey, where he owns his home.

2. Defendant General Electric Company d/b/a GE (hereinafter "GE") is a New York Domestic Business Corporation licensed to do business in the State of New Jersey. Among other things, it designed and manufactured combination listed household burglar and fire alarm system control units. In 2002, GE purchased Interlogix, a manufacturer of combination-listed household burglar and fire alarm system control units and changed the name to GE Security.

3. United Technologies Corp ("UTC") was a multinational conglomerate incorporated in Delaware and headquartered in Farmington, Connecticut. It developed and manufactured products in numerous areas, including but not limited to aircraft engines, aerospace systems, HVAC, elevators and escalators, fire and security, building automation, and industrial products, among others. In 2010, UTC acquired GE Security and in 2011, revived the Interlogix brand name for its combination-listed burglar and fire alarm system control units.

4. UTC Fire & Security Americas Corporation, Inc. d/b/a Interlogix ("UTC Security") became a wholly owned subsidiary of United Technologies Corporation and a manufacturer of, inter alia, home security products including the Interlogix brand of combination-listed burglar and fire alarm system control units in late 2015. It was incorporated in Delaware with its principal place of business in Arden Hills, Minnesota.

5. In April 2020, United Technologies spun off UTC Security into Carrier Global Corporation. Carrier Global Corporation ("Carrier") is a Delaware Corporation with its principal place of business at 13995 Pasteur Boulevard, Palm Beach Gardens, Florida 33418. According to its Form S-1 Registration Statement dated March 13, 2020, "Carrier provides its fire and security products and services under Autronica, Chubb, Det-Tronics, Edwards, Fireye, GST, ***Interlogix***, Kidde, LenelS2, Marioff, Onity, Supra and other brand names, and sells directly to customers as well as through manufacturers' representatives, distributors, dealers, value-added resellers and retailers." (Emphasis added).

NATURE OF THE ACTION

6. This action arises from the dangerous and serious defects, dangers and non-conformities in all combination-listed burglar and fire alarm system control units that were sold under the brand name Interlogix manufactured and sold by GE, UTC, UTC Security and Carrier.

The Interlogix alarm system control unit was manufactured and sold by GE from 2002 through 2009 under the GE Security name, and then UTC from 2010 through late 2015 under the Interlogix brand name and then UTC Security from late 2015 through early 2020 under the Interlogix brand name and then by Carrier under the Interlogix brand name after UTC Security was spun off into Carrier in early 2020. The serious defects, dangers and non-conformities which Defendants have known about for years, and/or were required to know about for years, and long before they designed, sold, and put their products out into the stream of commerce can lead to an instantaneous and catastrophic failure of the alarm system's combination-listed control unit during a fire. In this dangerously silent and non-functional state, instead of the alarm system performing its crucial life safety function by audibly warning all occupants inside the home of the fire emergency and the central station, the combination listed control unit fails. Consequently, the alarm system cannot warn families of the imminent life safety danger within their home, allowing for their timely escape before the premises become untenable.

7. The propensity for serious personal injury and/or death is both dramatically and foreseeably increased without all occupants in the home having the early warning and the window of opportunity needed to escape from the premises during a fire emergency.

8. As a result**,** persons inside the home may not wake up and/or they may die as a result of inhaling toxic fumes and/or they may become overcome by smoke inhalation and/or they may breathe in dangerous levels of carbon monoxide and/or they may become disoriented and/or they may become trapped inside the home due to fire and/or smoke conditions with no path to escape.

9. At the same time, without the central station being alerted to immediately notify the fire department, firefighters will not know to respond rapidly to help locate and take occupants

from inside of the home, to safety and out of harm's way. Additionally, if occupants of the home escape it would not be likely to occur without serious personal injury or death happening.

10. The dangers inherent in these control units renders them non-conforming to the minimum standards required by both UL and NFPA 72 Standards. [(UL) Underwriters Laboratories, Inc., UL-985 and UL-1023, and NFPA 72 Standards- National Fire Alarm Code and NFPA 72 National Fire Alarm and Signaling Code.] Notably, before the Defendants submitted their equipment to be listed by a Nationally Recognized Testing Laboratory (NRTL) such as UL-Underwriters Laboratories, Inc. – they were required to verify that their equipment was conforming.

11. If the data-bus circuit wiring is faulted and/or shorted anywhere it is installed throughout the home by fire, such as in the common areas, in the wall, attic or basement, the non-conforming control unit is instantly rendered non-functional (the "Alarm System Defect"). In gross contrast, if the combination listed control unit was conforming, fire attacking the single data-bus circuit of the combination listed control unit or any equipment that is required to connect to the single data-bus of the combination listed control unit shall not cause the system to be rendered non-functional, since conforming to both UL and NFPA 72 Standards specifically prohibits this loss of functionality from happening. Similarly, the State of New Jersey also requires compliance with the aforementioned, through the Uniform Construction Code, the Uniform Fire Code and NFPA 72.

12. Plaintiff brings this action for actual damages, equitable relief, including restitution, injunctive relief, declaratory relief and disgorgement of profits, and all other relief available on behalf of himself and all similarly situated individuals and entities (the "Class") who own combination listed single data-bus residential burglar and fire alarm system control units that were

manufactured or sold by Defendants under the brand names GE Security and Interlogix (the "Alarm Systems").

13. All the claims asserted herein arise out of the design, manufacture, advertising, promoting, marketing, distributing, selling and representing that their Combination Listed Household Burglar and Fire Alarm System Control Units met the requirements set forth in the applicable sections of both UL and NFPA 72 Standards making them listed for their intended purpose, safe and reliable. However, these representations were false.

14. Defendants knew or should have known before the time it sold their first Combination Listed Household Burglar and Fire Alarm System Control Unit Alarm System, that their control units were defective, dangerous and non-conforming to both UL 1023/UL-985 and NFPA 72 Standards.

15. The combination-listed control unit deficiencies and non-conformities dangerously and needlessly expose all occupants to an increased risk of property damage, serious personal injury, and/or death.

16. Defendants concealed these serious defects, dangers and non-conformities from consumers and/or failed to disclose the Alarm System Defects to Plaintiff and the class, while at the same time affirmatively representing the high quality and safety of their control unit systems meeting both UL and NFPA Standards. Defendants failed to remove these Alarm Systems from the marketplace and they failed to take appropriate remedial action, even though Defendants were aware that the single data-bus circuit of their combination listed control units was non-compliant to UL and NFPA regulations. Instead, Defendants marketed and sold their combination listed control units, even though it knew and/or should have known that it was non-conforming and was both defective and dangerous. The Defendants concealed these material defects from consumers

who relied on the Defendants combination listed control units for their security and life safety protection but it was to no avail.

17. Had Plaintiff and other members of the Class known of the Alarm System Defects and non-conformities at the time of sale, they would not have purchased the Defendants combination listed control unit. This information would have provided them with the opportunity to select code-complaint equipment. Notably, the Defendants combination listed control units did not, and do not even meet minimum fire code requirements as is required in New Jersey and Nationwide under both UL and NFPA Standards

18. Plaintiff and the Class have suffered an ascertainable loss because of Defendants' affirmative misrepresentations and omissions associated with the Alarm System Defects, including but not limited to, out of pocket losses and diminished value of the Alarm System.

19. Plaintiff seeks actual damages, injunctive relief, restitution and/or disgorgement of profits, statutory damages, attorneys' fees, costs, and all other relief available to Plaintiff and the Class.

PLAINTIFF'S EXPERIENCE

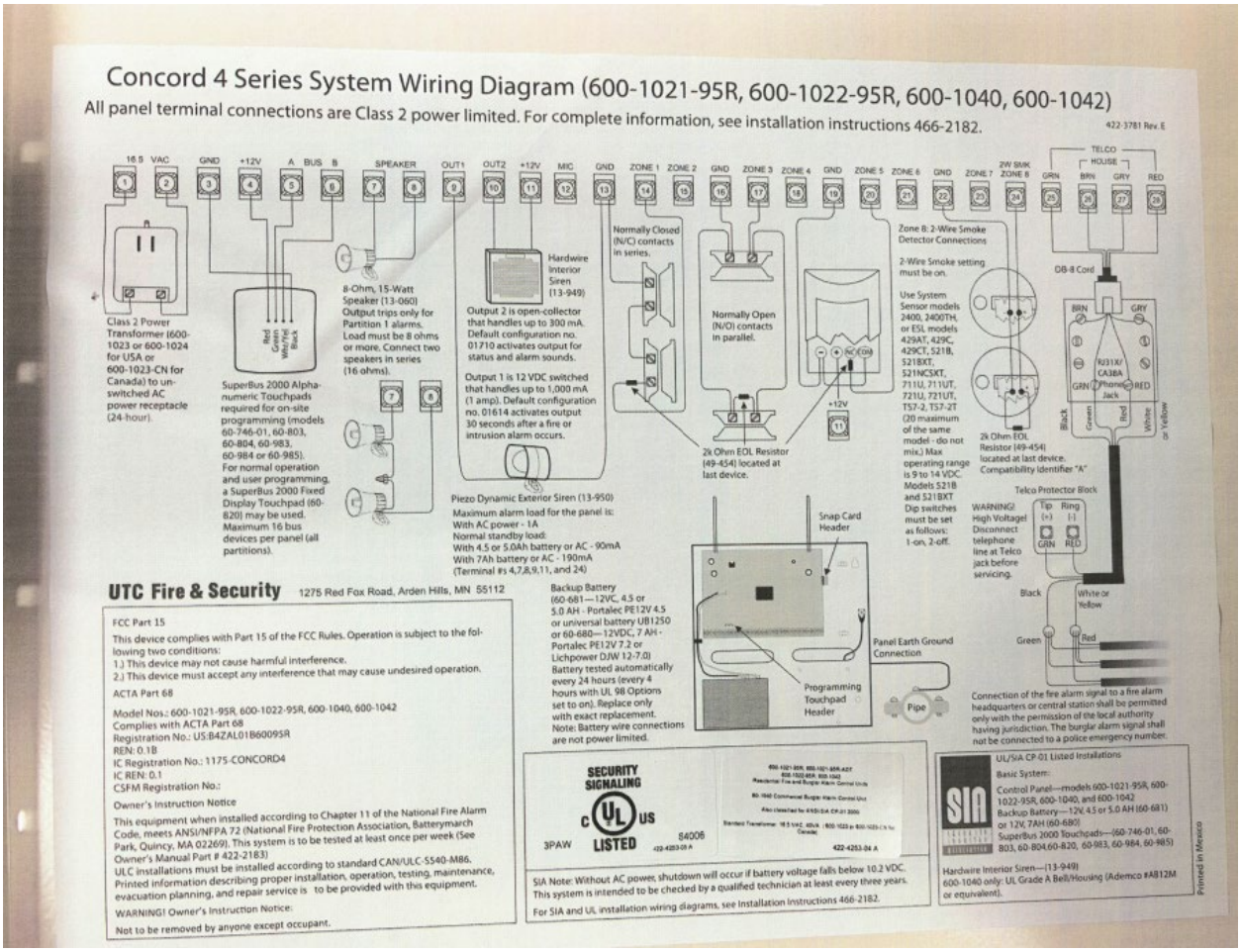
20. Plaintiffs owns a home located at 95 Audubon Road, Teaneck, New Jersey, 07666.

21. Plaintiff had a combination listed burglar and fire alarm system control unit installed in his home in the year 2002 consisting of a Model GE Security Version III control unit.

22. In 2006, Plaintiff upgraded the combination listed burglar and fire alarm system control unit that he had, to a Model Concord IV by Interlogix.

23. The Interlogix Concord IV combination listed control unit represents that it is UL listed and meets NFPA 72 standards.

24. This photo of the Concord IV Combination Listed Control Unit schematic makes these representations:



25. The installation guide for the Interlogix Concord IV Control Unit also represents that it is UL Listed with it specifically stating that their control unit complies with UL 985 and UL 1023. A copy of the installation guide is attached hereto as **Exhibit A**.

26. By the Defendants representing to consumers that the alarm system equipment is UL listed and meets NFPA 72 standards it is representing that it meets the minimum statutory standard requirements including UL 985 and UL 1023, and the relevant provisions of NFPA 72 regarding Combination Listed Burglar and Fire Alarm Control Units as is described in more detail below.

27. Despite these false representations, the single data-bus "combination listed" control unit(s) such as the Interlogix Concord III and IV control panels that were purchased by Plaintiff and installed in his home contains the Alarm System Defect and thus were both non-conforming and does not and/or never complied with NFPA 72, UL 985 and UL 1023 respectively.

28. In August 2021, when his alarm system was upgraded with a new wireless radio alarm transmitter, Plaintiff first learned that the Interlogix Concord IV Control Unit that was installed in his home contained the Alarm System Defect and was non-conforming.

29. Had Plaintiff known that the Interlogix Concord IV Control Unit that was installed in his home contained the Alarm System Defect, he would not have purchased it.

JURISDICTION AND VENUE

30. This Court has subject matter jurisdiction over this action pursuant to the Class Action Fairness Act of 2005, 28 U.S.C. §1332(d)(2), as the Class contains more than 100 members, at least one of whom maintains citizenship in a state diverse from Defendants and seeks in the aggregate more than Five Million Dollars ($5,000,000.00), exclusive of costs and interest. This Court also has personal jurisdiction over the parties because Defendants conduct substantial business in New Jersey, and all Defendants have had systematic and continuous contacts with New Jersey and has agents and representatives that can be found in this State.

31. Venue is proper in this district pursuant to 28 U.S.C. § 1391 because Plaintiff is a citizen of this judicial district, a substantial part of the events giving rise to the claims set forth herein occurred and emanated from this district, and all Defendants conduct has injured members of the Class residing in this district. Accordingly, this Court has jurisdiction over this action, and venue is proper in this judicial district.

TOLLING OF STATUTE OF LIMITATIONS

32. Any applicable statute(s) of limitations has been tolled by Defendant's knowing and active concealment and denial of the facts alleged herein. Despite their due diligence, Plaintiff and the other members of the Class could not have reasonably discovered the Alarm System Defect and Defendants have not only concealed the Alarm System Defect, but they failed to timely effectuate the necessary repairs.

33. Defendants were and remain under a continuing duty to disclose to Plaintiff and the other members of the Class the true character, quality, and nature of the Alarm System Defect, that the Alarm System Defect poses serious life safety concerns and unreasonable risks to all occupants of the home, and both eliminates the "alarm system" life safety benefits to the Plaintiff and diminishes the value of the Alarm System to Plaintiff and the Class. As a result of the active concealment by Defendants, all statutes of limitations otherwise applicable to the allegations herein have been tolled.

34. Moreover, because the Alarm System Defect could not be detected due to Defendants' purposefully fraudulent concealment, Plaintiff and the Class were not reasonably able to discover the Alarm System Defect until long after purchasing the Defendants Combination Listed Burglar and Fire Alarm Control Unit, despite their exercise of due diligence. Thus, the discovery rule is applicable to the claims asserted by Plaintiff and the Class.

35. Any applicable statute of limitation has therefore been tolled by Defendants' knowing, active concealment and denial of the facts alleged herein. Defendants are estopped from relying on any statutes of limitation because of its concealment of the Alarm System Defect.

FACTUAL BACKGROUND

The Reasonable And Legitimate Expectations Of Plaintiff And The Members Of The Putative Class

36. Consumers purchasing Alarm Systems reasonably and legitimately expect that they properly and safely function and operate for years, particularly in the event of an unpredictable fire emergency happening in their home.

37. In purchasing an Alarm System, Plaintiff and the other members of the Class reasonably and legitimately expected the Alarm System to be reliable, and to operate in accordance with all applicable codes and standards – including immediately sounding an audible fire alarm inside the home so that its inhabitants would be immediately warned of a fire emergency, and, as a result, be able to escape from the home before the premises become untenable.

38. In purchasing the Alarm System, Plaintiff and the other members of the Class reasonably and legitimately expected that the Alarm System would be free from the Alarm System Defect(s).

39. The existence of the Alarm System Defect(s) is a fact that would be considered material to reasonable consumers deciding whether or not to purchase this Alarm System equipment.

40. Customers like Plaintiff and the other members of the Class, reasonably and legitimately expect and assume that an Alarm System will function in its intended manner, and will not be subject to catastrophic failure in the event of a fire, which is the very thing that the combination listed control unit is supposed to be designed to detect, and protect the Plaintiffs against, so that it can warn all occupants in the home of a fire emergency. Plaintiff and the other members of the Class also reasonably and legitimately expect and assume that Defendants will

not sell Alarm Systems with a known defect, will disclose any such Defects to consumers when they learn of them, and take all steps necessary to remedy any defect in a manner that does not cause dangers, an increase in the risk of serious personal injury and/or death and additional cost to consumers.

41. It was reasonable and legitimate for Plaintiff and the other members of the Class to expect Defendants not to conceal serious defects and non-conformities from them – such as the Alarm System Defect described herein, and to deny the existence of these defects for years after becoming aware of the problems.

42. Had Plaintiff and other members of the Class known about the Alarm System Defect while they were in the market for purchasing an Alarm System, they would not have purchased this Alarm System due to the increased risk of its instantaneous failure during a fire, foreseeably resulting in loss of property, serious personal injury and/or death.

The Alarm System Defect and Defendant's Awareness of the Defect

NFPA 72- National Fire Alarm Code and NFPA 72- National Fire Alarm and Signaling Code

43. The National Fire Protection Association (NFPA) has indicated that 60% of residential fire deaths occur when smoke detection is not present or disabled. See Ahrens, M. Smoke Alarms in US Home Fires. NFPA Research Report. 2021. Thus, many homeowners across the country install fire alarm systems to alert them to a potential fire in their homes which could ultimately save their lives. Most of these home systems contain combination listed burglar and fire alarm control units.

44. All household combination listed burglar and fire alarm system control units contain a single data-bus circuit. The data-bus circuit consists of four wires that are required to be terminated onto the systems circuit board. Two of the wires consist of the data side of the data-

bus circuit, and the other two wires are for the (+) and (-) 12 volts of DC power that is needed to operate the data bus. In order for the alarm system to function, the data-bus terminals in the control units are wired to alarm system equipment that is installed throughout the home or business. This alarm system equipment includes but is not limited to remote system keypads, wireless radio receivers, wireless radio alarm transmitters and zone expansion modules. A diagram of the single data-bus combination-listed burglar and fire alarm control unit is attached hereto as **Exhibit B.**

45. Combination Listed Household Burglar and Fire Alarm System Control Units are governed by UL Standards – Underwriters Laboratories, Inc – specifically UL-1023 Household Burglar-Alarm System Units and UL-985, Standard for Household Fire Warning System Units as well as NFPA 72 Standards, specifically NFPA 72,® National Fire Alarm Code and/or NFPA 72 National Fire Alarm and Signaling Code. NFPA 72 is recognized as the most authoritative standard for fire alarm systems nationwide. It is adopted by reference in most, if not all, model building codes and some version of NFPA 72® is adopted in some manner in every state in the nation (NFPA Codefinder, 2022).

46. NFPA 72®, National Fire Alarm Code covers the application, installation, location, performance, and maintenance of fire alarm systems and their components. NFPA 72®, National Fire Alarm and Signaling Code provides the latest safety provisions to meet society's changing fire detection, signaling, and emergency communications demands. In addition to the core focus on fire alarm systems, the Code includes requirements for mass notification systems used for weather emergencies, terrorist events, biological, chemical, and nuclear emergencies, and other threats.

47. Alarm equipment manufacturers have a duty to comply with UL Standards and NFPA 72 Standards for Household Occupancies. Both UL Standards and NFPA 72 are adopted by most Authorities Having Jurisdiction across the country and NFPA 72 is considered both an authoritative treatise and statutory duty in most jurisdictions.

48. Section 29.10.7.5 of the NFPA 72 Standard states that "faults in other systems (such as a burglar alarm system) or components, shall not affect the operation of the fire alarm system." Notably, the word "shall" in NFPA 72 has always constituted a mandatory requirement.

49. Section 29.10.7.6 then states:

> Where common wiring is employed for a combination system, the equipment for other than the fire and carbon monoxide alarm system shall be connected to the common wiring of the system so that short circuits, open circuits, grounds, or any fault in this equipment or interconnection between this equipment and the fire and carbon monoxide alarm system wiring does not interfere with the supervision of the fire and carbon monoxide alarm system or prevent alarm or trouble signal operation.

50. These crucial requirements have been in NFPA 72 Standards since 1999. A matrix summarizing the section numbers of the various editions of the NFPA 72 over the years since 2002, where the requirements in the current section of 29.10.7.6 is/was located, is attached hereto as **Exhibit C**.

Underwriters Laboratories, Inc. (UL) Standards

51. "Since 1894, UL has conducted rigorous independent research and developed safety standards to improve living and working conditions throughout the world…" They "publish consensus standards that guide the safety, performance, and sustainability of new products and evolving technologies and services delivering solutions that range from household appliances to smoke alarms, from batteries and building materials to cybersecurity and autonomous vehicles." See https://ul.org/about.

52. Defendants submitted their Combination Control Unit to UL to have it tested for compliance with applicable UL Standard 1023, UL Standard 985 and NFPA 72. However, the Defendants knew or were required to know that its product was non-conforming before it submitted its equipment to UL.

53. UL 985 describes the Standard for Household Fire Warning System Units.

54. UL 1023 describes the Standard for Household Burglar Alarm System Units, including the use of combination listed fire-burglar alarm system control units.

55. Alarm equipment manufacturers whose equipment is listed to UL 985 are also required to comply with NFPA 72 Standards.

56. UL 985, Household Fire Warning System Units, 5th Edition published 2000, states:

> 1.4 These requirements also apply to the use of combination systems, such as a combination fire-burglar alarm system control unit, which uses circuit wiring common to both systems. When common wiring is used for combination systems, it shall be connected in such a manner that internal fault conditions (shorts, opens, grounds) in the nonfire alarm (burglary) system circuit wiring, or faults between the fire and nonfire alarm system circuits, will not interfere with the supervision of the fire alarm system or prevent intended alarm signal transmission.

57. Additionally, from 2000 to 2015, the following summarizes the requirements in the 5th Edition of UL 985:

> 41.4 An open or ground fault in any circuit extending from a household control unit, other than the initiating device circuit, shall not affect the operation of the control unit except for the loss of the function extending from that circuit.
>
> 41.6 A fault condition, open, ground, or short of other than a fire alarm circuit of a combination control unit shall not affect the fire-alarm signaling.

58. The 5th Edition of UL-985- Household Fire Warning System Units at Section 41.4 has been incorporated into the 6th edition of UL-985 standards at section 44.2.3 to present day.

The 6th Edition of UL-985 was published in 2015 and had its effective date in November of 2019. Notably, the 6th Edition of UL 985 sets forth more stringent requirements as follows:

> Section 41.3.1.3 – Short circuit or open circuit single faults in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall not impede or impair the monitoring for integrity of the fire alarm system, nor impede or impair any fire alarm signal transmissions or operations.
>
> Section 41.3.1.6 – The required operation of the fire alarm equipment shall not be impaired by any failure of the non fire alarm equipment hardware, software or circuits, or by any maintenance procedure, including removal or replacement of defective equipment or powering down of the non-fire equipment.

59. UL 1023, Standard For Household Burglar-Alarm System Units 6th Edition published 2015 (Nov. 2019 effective date) states, in pertinent part that:

> Section 1.3 – These requirements also apply to the use of combination systems, such as a combination fire-burglar-alarm system control unit. A combination system is connected in such a manner that fault conditions (shorts, opens, grounds) in the burglar-alarm system circuit wiring, or interconnections between the fire and burglar-alarm system circuits, will not interfere with the supervision of the fire alarm system or will not prevent intended alarm signal operation.
>
> Section 1.4 – A combination household fire and burglar alarm system shall also comply with the Standard for Household Fire Warning System Units, UL 985.

60. The requirements of UL 1023 at sections 1.3 and 1.4 have been part of UL standards since 1996.

61. All of these requirements set forth that UL-985, in combination with UL-1023, and NFPA 72, universally mandate that all household combination listed control units are protected from a short circuit condition being introduced onto to the non-fire alarm equipment and/or its wiring, causing the fire alarm system to being rendered non-functional. Notwithstanding, the Defendants dangerous and non-conforming combination listed control units, catastrophically shut

down, as a result of the introduction of a short circuit condition as elaborated to above causing this failure, since the Defendants equipment violates the minimum requirements of UL and NFPA 72 Standards and it is strictly prohibited.

62. The parallel hardwired connection requirements on the circuit board of the Defendants combination listed control unit requires that the four (4) conductor single data-bus circuit(s) be terminated in parallel, with all of the other devices that are also required to be connected in parallel to the data-bus circuit for functionality, such as wireless receivers, dialer capture and platform wireless radio alarm transmitters, zone expansion modules, and input/output modules.

63. On the other side of the technical spectrum, the Auxiliary DC power output circuit terminals of the control unit, have been specifically designed by the Defendants to require both the Auxiliary DC power output, and the DC power that is required for the data-bus circuit to reside (be terminated) on the very same positive (+) and negative (-) terminals of the control units circuit board. Likewise, the auxiliary DC power that is required for burglar alarm intrusion detection devices, such as audio glass break detectors and motion detectors are also required to connect in parallel to these terminals.

64. Accordingly, a short circuit condition being introduced onto the DC power wiring that is used to operate burglar alarm audio glass break detectors and motion detectors, will instantly shut down the Defendants control unit.

65. Therefore, once any portion of the data-bus circuit equipment or wiring contains a short circuit condition, it will instantly shut down the control panels data-bus circuit and all of the interconnected data-bus connected equipment on the system, causing a catastrophic failure.

66. The list of equipment which is required to reside (in parallel) on the single data-bus violates UL Standards- UL-1023, UL-985 and NFPA 72.

67. In sum, the auxiliary DC power output circuit and/or its interconnected wiring and/or its DC powered devices that are installed throughout and within the household occupancy using the same (+) and (-) power terminals that the data-bus circuit utilizes significantly expands the control units danger and vulnerabilities to catastrophic failure, once a fire condition introduces a short circuit condition onto the data-bus wiring and/or onto any of the equipment that is required to connect to the single data-bus circuit.

68. Fundamentally, once the single data-bus circuit wiring leaves the control unit housing it exposes the entire alarm system to catastrophic and instantaneous failure based upon this data-bus circuit wiring and/or when any of the equipment that is required to be connected to the data bus is introduced to a short circuit condition by fire, in any location where the data-bus circuit wiring and/or its equipment is installed throughout the household occupancy.

69. Based on the required design characteristics of the Defendants' equipment, it creates foreseeably dangerous vulnerabilities to the overall functionality and reliability of the alarm systems control unit and to all occupants of the home who rely on the system to provide them with intrusion detection and early warning fire and life safety protection.

70. In fact, on September 17, 2021, Jeffrey D. Zwirn of IDS Research and Development, Inc., a nationally recognized alarm and security expert with over 45 years of specialized education, skill, knowledge, training, experience and peer reviewed credentials in the alarm and security industry, emailed the National Fire Protection Association (NFPA) asking them to confirm that if "a fault in the burglar alarm system will affect the operation of the fire alarm system, and if equipment for other than the fire alarm system, being the burglar alarm

system, that is connected to the common wiring of the system (the single data-bus) will interfere with the supervision of the fire alarm system and/or it will prevent alarm or trouble signal operation because once a short circuit condition is introduced onto the auxiliary power output of the system the zone expansion module(s) referenced above is no longer able to function since it instantly loses DC power…would you agree that the combination-listed control unit does not comply with NFPA 72 Standards."

71. On September 21, 2021, Christopher D. Coache, Senior Electrical Engineer of the NFPA responded stating, "[y]ou are correct that a failure in another system connected to the fire alarm system cannot affect the function of the fire alarm system. Also, the signals from another system such as a burglar system cannot take priority over the life safety signals of the fire alarm system." A copy of the email exchange is attached hereto as **Exhibit D**.

72. The Alarm System Defect described causes a combination listed burglar and fire alarm system control unit the exact situation that NFPA 72 standards and the Senior Electrical Engineer of the NFPA states cannot occur – a failure in the fire alarm system due to the failure in another part of the system is strictly prohibited.

73. In fact, the Alarm System Defect was analyzed and confirmed by Combustion Science & Engineering, Inc. ("CSE"), a company that for more than twenty years has been dedicated to the study, advancement, and application of combustion and fire sciences, conducted an independent evaluation of the Alarm System Defect.

74. CSE confirmed the Alarm System Defect of combination listed single data-bus residential burglar and fire alarm system control units, such as those manufactured or sold by Defendants under the brand names GE Security and Interlogix, and their noncompliance to the

minimum standards required by both UL and NFPA 72. Indeed, in a July 5, 2022 report, CSE concluded:

> In sum, CSE's review of the codes and standards indicates that these documents clearly indicate that an electrical short circuit on non-fire equipment, including the data-bus and its wiring, shall not render a combination-listed fire/security system control unit non-functional. This code requirement applies for both household and commercial combination-listed systems and dates back to at least the early 2000s. UL's implementation and interpretation of these sections of their standards and NFPA 72® have allowed this hypothesized and dangerous mode of failure to exist, despite their testing and ergo, combination-listed control units have become listed despite nonconformities. Failure of combination-listed control units to meet UL and NFPA standards violates the adopted fire code in each state of the United States and needlessly puts occupants inside an occupancy at an increased risk of serious personal injury and/or death during a life safety emergency.
>
> …
>
> As has been demonstrated in CSE's analysis and the experiments conducted, there is both scientific certainty and validity to Mr. Zwirn's hypothesized mode of failure for combination-listed single data-bus fire and burglar alarm control units, and they do not conform to UL and NFPA standards. Given that, from a Fire Protection Engineering perspective, this equipment is nonconforming, and it is dangerous to all persons who rely on it for mission critical functional and reliable life safety.

See Stephen M. Olenick, Michael S. Klassen & Zachary Switzer, Analysis of the Hypothesized Data-Bus Failure Mode of Combination-Listed Fire/Security Control Units, at 24, 42 (July 5, 2022), attached hereto as **Exhibit E**.

75. Plaintiff alleges that at all relevant times, specifically at the time he purchased the Alarm System, Defendants knew or were required to know that they had manufactured a non-conforming combination listed control unit with the Alarm System Defect that failed to meet the applicable and minimum UL and NFPA Standards. Defendants were under a duty to disclose the Alarm System Defects based upon its exclusive knowledge of and/or concealed material information regarding the Alarm System Defect from consumers like the Plaintiff. Defendants

failed to disclose the Alarm System Defect to Plaintiff, other Class members, or the public at any time or place or in any manner such that it could (and would) have affected Plaintiff's and other Class members' pre-sale decision to purchase the Alarm Systems.

CLASS ACTION ALLEGATIONS

76. Plaintiff brings this action on behalf of himself, and all other persons similarly situated, pursuant to Rules 23(b)(2) and 23(b)(3) of the Federal Rules of Civil Procedure on behalf of the following class and subclass (collectively, the "Classes"):

The Nationwide Class

All persons or entities in the United States who own, or have owned, an Alarm System.

The New Jersey Subclass

All persons or entities in New Jersey who own, or have owned, an Alarm System.

Excluded from all Classes

Excluded from the Classes are: (a) Defendants, any entity in which Defendants have a controlling interest, and their legal representatives, officers, directors, employees, assigns, and successors that purchased the Alarm Systems; (b) the judge to whom this case is assigned and any member of the judge's immediate family; and (c) individuals with claims for personal injury, wrongful death and/or emotional distress.

77. Numerosity/Impracticability of Joinder: The members of the Class are so numerous that joinder of all members would be impracticable. Based upon knowledge and belief approximately 15 million Class Alarm Systems were purchased by Class members.

78. Commonality and Predominance: There are common questions of law and fact that predominate over any questions affecting only individual members of the Class. These common legal and factual questions, include, but are not limited to, the following:

a. Whether the Alarm Systems have a design defect.

b. Whether the Defendants properly tested its combination listed control unit to UL-1023, UL-985 and NFPA 72 Standards before it submitted its product to Underwriters Laboratories, Inc. for listing.

c. Whether the Defendants identified that its combination listed control unit was not conforming to UL and NFPA 72 Standards before being submitted to Underwriters Laboratories, Inc. for listing.

d. Whether the Defendants received notice of its combination listed control unit failing to comply with UL and NFPA 72 Standards by any Nationally Recognized Testing Laboratory (NRTL) such as Underwriters Laboratories, Inc. but refused and/or failed to correct this control units non-conformities.

e. Whether Defendants knew, or reasonably should have known, that the Alarm Systems were defectively designed, manufactured, marketed, distributed, advertised, warranted, sold, and serviced.

f. Whether Defendants knew or reasonably should have known of the Defects before it sold the Alarm Systems to Plaintiffs and the other members of the Class.

g. Whether Defendants actively and intentionally concealed, failed to disclose and/or omitted material information in its marketing, advertising, and sale of the Alarm Systems.

h. Whether Plaintiff and the other members of the Class are entitled to equitable relief, including but not limited to a preliminary and/or permanent injunction.

i. Whether Defendants violated New Jersey's Consumer Fraud Act, and the consumer protection laws of the states involving class members.

j. Whether Defendants' conduct violates warranty laws, and other laws as asserted herein.

k. Whether, as a result of Defendants' omissions and concealments of material facts related to the Alarm System Defects, Plaintiff and the other members of the Class have suffered ascertainable losses, and whether Plaintiff and the other members of the Class are entitled to monetary damages and/or other remedies, and if so the nature of any such relief; and/or

l. Whether Defendants' acts and/or omissions entitle Plaintiff and the other members of the Class to treble damages, attorneys' fees, prejudgment interest and cost of suit.

79. Typicality: Plaintiff's claims are typical of the claims of the members of the Class. Plaintiff and the other members of the Class have suffered similar injury by the same wrongful practices by Defendants. The claims of Plaintiff and the other members of the Class all arise from the same wrongful practices and course of conduct and are based on the same legal and remedial theories.

80. Adequacy Of Representation: Plaintiff will fully and adequately assert and protect the interests of the members of the Class and have retained class counsel who are experienced and qualified in prosecuting class actions. Neither Plaintiff nor his attorneys have any interests that are contrary to or conflicting with the members of the Class.

81. Superiority of Class Action And Impracticability of Individual Actions: A class action is superior to all other available methods for the fair and efficient adjudication of this lawsuit, because individual litigation of the claims of all members of the Class is not economically feasible and is procedurally impracticable. While the aggregate damages sustained by the members of the Class are in the millions of dollars, and are no less than five million dollars, upon information and belief, the individual damages incurred by each member of the Class resulting from Defendant's wrongful course of conduct are too small to warrant the expense of individual suits. It is estimated that the part necessary to effectuate each repair would cost only around $100 and installation of the part would only require one service call for 15-20 minutes and around $75. The likelihood of individual members of the Class prosecuting their own separate claims is remote, and, even if every Class member could afford individual litigation, the court system would be unduly burdened by individual litigation of such cases. Individual members of the Class do not have a significant interest in individually controlling the prosecution of separate actions, and individualized litigation would also present the potential for varying, inconsistent, or contradictory

judgments and would magnify the delay and expense to all of the parties and to the court system because of multiple trials of the same factual and legal issues. Plaintiff knows of no difficulty to be encountered in the management of this action that would preclude its maintenance as a class action. In addition, Defendants have acted or refused to act on grounds generally applicable to the members of the Class and, as such, final injunctive relief, or corresponding declaratory relief with regard to the members of the Class as a whole is appropriate.

CLAIMS FOR RELIEF

FIRST COUNT

(Violations of New Jersey's Consumer Fraud Act, N.J.S.A. § 56:8-2, et seq.)

82. Plaintiff on behalf of himself and all others similarly situated, incorporate by reference the allegations contained in the preceding paragraphs of this Complaint.

83. This claim is brought on behalf of the Nationwide Class and New Jersey Subclass.

84. Defendants have engaged in deceptive, unconscionable, unfair, fraudulent and/or misleading commercial practices in the advertising, promoting, marketing, distributing and selling of the Class Alarm Systems it knew to be defective.

85. Defendants intentionally omitted the fact that its goods, merchandise and/or services did not have characteristics, uses, benefits, or quantities that were advertised and promoted, and failed to disclose that its goods, merchandise and/or services were not of a particular standard, quality or grade.

86. Defendants had a duty to Plaintiff and the Nationwide Class and New Jersey Subclass to disclose the defective nature of the Class Alarm Systems and the Alarm System Defects because:

a. Defendants were in a superior position to know the true state of facts about the Alarm System Defects and repair costs in the Alarm Systems.

b. Plaintiff and the Nationwide Class and New Jersey Subclass could not reasonably have been expected to learn or discover that the Alarm Systems had dangerous safety defects until after manifestation of the Alarm System Defects; and

c. Defendants knew that Plaintiff and the Nationwide Class and New Jersey Subclass could not reasonably have been expected to learn or discover the Alarm System Defects and the associated corrective action repair costs until the manifestation of the Alarm System Defects.

87. In failing to disclose the Alarm System Defects and the associated risks and repair costs, Defendants undertook active and ongoing steps to intentionally conceal the Alarm System Defects, and has concealed, failed to disclose and/or omitted material facts from Plaintiff and other members of the Nationwide Class and New Jersey Subclass with respect to the Alarm System Defects in the Alarm Systems.

88. Defendants intended that Plaintiff and the other members of the Nationwide Class and New Jersey Subclass would rely upon its acts of concealment and/or omission by purchasing the dangerous, defective and non-conforming Alarm Systems at full price rather than purchasing other alarm systems without the Alarm System Defects.

89. Defendants intended that Plaintiff and the other members of the Nationwide Class and New Jersey Subclass would rely upon its acts of concealment and/or omission to avoid replacing the defective parts during the warranty period.

90. Defendants' omissions were objectively deceptive and had the capacity to deceive reasonable consumers under the circumstances. The fact that Defendants knew about and failed to disclose that the Alarm System Defects in the Alarm Systems was a material fact that a reasonable and/or unsophisticated consumer would attach importance to at the time of purchase. This fact would influence a reasonable consumer's choice of action during the purchase of an alarm system.

91. Such practices contravene the New Jersey Consumer Fraud Act, N.J.S.A. 56:8-1, et seq.

92. As a direct and proximate result of Defendants' violations of the NJCFA, Plaintiff and the other members of the Nationwide Class and New Jersey Subclass have suffered ascertainable losses, which include but are not limited to, the amount they paid for the Alarm System or the cost to repair the Alarm System such that it operates in accordance with all applicable codes and regulations described in this Complaint. Further, based on the intentionally dishonest nature of Defendants' conduct, which was directed at the Class and Subclass, Defendants should also be held liable to the Class and Subclass for punitive damages in the form of treble damages and Attorneys' fees in accordance with the NJCFA.

SECOND COUNT

(Common Law Fraud)

93. Plaintiff, on behalf of himself and all others similarly situated, incorporates by reference the allegations contained in the preceding paragraphs of this Complaint.

94. The above-described conduct and actions constitute common law fraud by way of misrepresentations, concealment and omissions of material facts made by Defendants in inducing Plaintiff and the Class and Subclass to purchase Alarm Systems with the Alarm System Defects.

95. In failing to disclose the Alarm System Defects and the associated risks and repair costs, Defendants undertook active and ongoing steps to intentionally conceal the Alarm System Defects, and has concealed, failed to disclose and/or omitted material facts from Plaintiff and other members of the Nationwide Class and New Jersey Subclass with respect to the Alarm System Defects in the Alarm Systems.

96. Defendants sold Alarm Systems which they knew, or reasonably should have known, contained the Alarm System Defects and required repair or replacement.

97. Defendants made material misrepresentations by advertising that the Alarm Systems met UL and NFPA standards for household combination listed burglar and fire alarm system control units when in fact they did not. Indeed, the Defendants' Alarm System is/was manufactured in a such a way that if there is a fault or short circuit condition from fire attacking the data-bus circuit wiring and/or any of the equipment that is required to be connected to the control unit's single data-bus circuit of the control unit, it renders the control panel non-functional. If the data-bus circuit wiring is faulted and/or shorted anywhere it is installed throughout the home by fire, the control panel is instantly rendered non-functional and thus the fire alarm systems smoke detectors are rendered non-functional. Consequently, this renders them non-conforming to the minimum standards set by both the UL and NFPA 72 Standards, both of which Defendants represent their Alarm Systems comply with.

98. Defendants intended that the Plaintiffs and the other members of the Class and Subclass rely upon the above-described uniform misrepresentations, concealment and omissions.

99. Plaintiffs and other Class and Subclass Members justifiably relied upon Defendants' misrepresentations, concealment and omissions to their damage and detriment.

100. Plaintiffs and the Class and Subclass suffered the damages described in this complaint as a proximate result thereof.

THIRD COUNT

(Negligent Misrepresentation)

101. Plaintiff, on behalf of himself and all others similarly situated, incorporates by reference the allegations contained in the preceding paragraphs of this Complaint.

102. Defendants made material misrepresentations as described in paragraphs 20 through 75 above by advertising that the Alarm Systems met the UL and NFPA standards for household combination listed burglar and fire alarm systems when in fact they did not. Defendants knew, or should have known, that these statements were inaccurate.

103. Defendants intended their material misstatements to induce Plaintiff and the Class and Subclass to rely upon them, and Defendants expected Plaintiff and the Class and Subclass to rely upon them.

104. Plaintiff and the Class and Subclass reasonably relied on the misstatements when they purchased the Alarm Systems.

105. Plaintiffs and the Class and Subclass suffered the damages described in this complaint as a proximate result thereof.

FOURTH COUNT

(Breach of Express Warranty)

106. Plaintiff, on behalf of himself and all others similarly situated, incorporates by reference the allegations contained in the preceding paragraphs of this Complaint.

107. This claim is brought on behalf of the Nationwide Class and New Jersey Subclass.

108. By expressly representing that the Alarm Systems was UL listed and complied with NFPA 72, Defendants created an express warranty that the Alarm Systems would not contain the Alarm System Defect.

109. Defendants breached these warranties by selling Alarm Systems which they knew, or reasonably should have known, contained the Alarm System Defects and required repair or replacement.

110. Plaintiff notified Defendants of the breach within a reasonable time, and/or was not required to do so because affording Defendants a reasonable opportunity to cure its breach of written warranties would have been futile. Defendants also knew of the Alarm System Defects and yet chose to conceal it and to not comply with their warranty obligations.

111. As a direct and proximate result of Defendants' breach of the Alarm Systems' express warranties, Plaintiff and the other members of the Nationwide Class were damaged by, among other things, being forced to expend monies – and will continue to be forced to expend monies – to repair and/or replace their alarm systems and diminution in value of their alarm systems.

112. Plaintiff, and members of the Nationwide Class and New Jersey Subclass have complied with all obligations under the warranty, or otherwise have been excused from performance of said obligations as a result of Defendant's conduct described herein.

FIFTH COUNT

(Breach of Implied Warranty)

113. Plaintiff, on behalf of himself and all others similarly situated, incorporates by reference the allegations contained in the preceding paragraphs of this Complaint.

114. This claim is brought on behalf of the Nationwide Class and New Jersey Subclass.

115. Defendants were at all relevant times the manufacturer, distributor, warrantor, and/or seller of the Alarm Systems. Defendants knew, or reasonably should have known, of the specific use for which the Alarm Systems were purchased as represented in its "listing" of their combination control unit to the public, albeit it was false and untrue.

116. Defendants provided Plaintiff and the other members of the Nationwide Class and New Jersey Subclass with an implied warranty of merchantability that the Alarm Systems, and any components thereof, are merchantable and fit for the ordinary purposes for which they were sold.

117. Defendants impliedly warranted that the Alarm Systems were of merchantable quality and fit for such use. This implied warranty of merchantability included, among other things: (1) a warranty that the Alarm Systems, and the wiring and associated technology for operation were manufactured, supplied, distributed, and sold were safe, complied with the applicable and mandated codes and standards for household burglar and fire alarm control units and that they were reliable for providing fire alarm life safety protection, and would not experience failure from exposure to fire and (ii) a warranty that the Alarm Systems would be fit for their intended use.

118. Contrary to the applicable implied warranties of merchantability, the Alarm Systems were not fit for their ordinary and intended purpose of providing Plaintiff and the other members of the Nationwide Class and New Jersey Subclass with reliable fire alarm protection that would not experience failure from its exposure to fire.

119. Defendants breached the Alarm Systems' implied warranty of merchantability by selling Plaintiff and the other members of the Nationwide Class and New Jersey Subclass, fire alarm systems and/or components thereof, that are not fit for their ordinary/intended purpose of providing reliable life safety fire alarm protection that would not experience failure from exposure to fire because, inter alia, the Alarm Systems suffered from the Alarm System Defects at the time of sale.

SIXTH COUNT

(Breach of Written Warranty Under the Magnuson-Moss Warranty Act, 15 U.S.C. § 2301 *et seq*.)

120. Plaintiff, on behalf of himself, and all others similarly situated, incorporates by reference the allegations contained in the preceding paragraphs of this Complaint.

121. This claim is brought on behalf of the Nationwide Class.

122. Plaintiff and other members of the Nationwide Class are "consumers" within the meaning of the Magnuson-Moss Warranty Act, 15 U.S.C. § 2301(3).

123. The Alarm Systems are "consumer products" within the meaning of 15 U.S.C. § 2301(1).

124. Defendant's express warranty is a "written warranty" within the meaning of 15 U.S.C. § 2301(6).

125. Defendant breached their express warranty by distributing, and selling fire alarm systems which they knew, or reasonably should have known, contained the Alarm System Defects and required repair or replacement within the applicable warranty periods, and/or refused to honor the warranties by providing free repairs and/or replacements during the applicable warranty period or periods.

126. Defendants' breach of the express warranty deprived the Plaintiff and the other members of the Nationwide Class the benefits of their bargains.

127. The amount in controversy of Plaintiff's individual claims meets or exceeds the sum or value of $25.00. In addition, the amount in controversy meets or exceeds the sum or value of $50,000 (exclusive of interests and costs) computed on the basis of all claims to be determined in this suit.

128. Defendants have been afforded a reasonable opportunity to cure its breach of written warranty.

129. As a direct and proximate result of Defendants' breach of written warranty, Plaintiff and other members of the Class sustained damages and other losses in an amount to be determined at trial. Defendants' conduct damaged Plaintiff and other members of the Nationwide Class who are entitled to recover damages, consequential damages, specific performance, diminution in value, costs, attorneys' fees, rescission, and/or other relief as appropriate.

SEVENTH COUNT

(Unjust Enrichment)

130. Plaintiff and proposed class members incorporate by reference all allegations in the above preceding paragraphs as if set forth fully in this count.

131. This claim is brought on behalf of the Nationwide Class and New Jersey Subclass.

132. The Alarm Systems were defective in that they do not provide reliable fire alarm life safety protection when exposed to fire as they are required to provide pursuant to UL and NFPA Standards.

133. The Defendants benefited financially from its breaches of warranty, misrepresentations and fraud as described in this complaint. The Defendants denied legitimate warranty claims and obtained further unwarranted financial gain.

134. Plaintiff and the Class members sustained monetary damages as described in this complaint.

135. Allowing the Defendants to retain its monetary enrichment from its wrongful and unlawful acts would be unjust and inequitable.

136. Plaintiff and the Class and Subclass members request that the Defendants disgorge its profits from its wrongful and unlawful conduct and that the Court establish a constructive trust

funded by the benefits conferred upon the defendant as a result of its wrongful conduct. Plaintiff and the Class members should be designated beneficiaries of the trust and obtain restitution for out-of-pocket expenses caused by the defendant's conduct.

EIGHTH COUNT

(Violations of the Truth-in-Consumer Contract, Warranty and Notice Act)

137. Plaintiff and proposed class members incorporate by reference all allegations in the above preceding paragraphs as if set forth fully in this count.

138. This claim is brought on behalf of the New Jersey Subclass.

139. Plaintiff and those similarly situated are "consumers" within the meaning of TCCWNA, as set forth at N.J.S.A. 56:12-15.

140. Defendants are sellers within the meaning of TCCWNA, as set forth at N.J.S.A. 56:12-15 and -17.

141. TCCWNA, at N.J.S.A. 56:12-15, provides in relevant part that "no seller, creditor, lender or bailee may offer or enter into any written consumer contract or give or display any notice which includes any provision that violates a clearly established right of the consumer or responsibility of the seller, lessor, creditor, lender or bailee as established by State or Federal law at the time the offer is made or the consumer contract is signed or the warranty, notice or sign is given or displayed."

142. By violating the CFA, and a clearly established legal right of a consumer and/or responsibility of the seller to not engage in any misrepresentations, deception, or unconscionable commercial conduct in connection with consumer sales as detailed in this Complaint, Defendants thereby violated the Truth-in-Consumer Contract, Warranty and Notice Act, N.J.S.A. 56:12-14 *et seq*.

143. As the result of Defendants' violations of TCCWNA, Plaintiffs and the Class Members are entitled to statutory damages of not less than $100 each as provided by N.J.S.A. 56:12-17.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff on behalf of himself and on behalf of the Nationwide Class, and New Jersey Subclass, prays for judgment against Defendants granting the following relief:

1. Certification of the proposed Nationwide Class, and New Jersey Subclass and appointing Plaintiff to represent the Classes and Plaintiff's counsel as class counsel;

2. All recoverable compensatory, statutory, punitive and other damages sustained by Plaintiffs and the other members of the Nationwide Class, and New Jersey Subclass;

3. Restitution and disgorgement of all amounts obtained by Defendant as a result of its misconduct, together with interest thereon;

4. Actual, treble, and/or statutory damages for injuries suffered by Plaintiff and the other members of the Nationwide Class, and New Jersey Subclass in the maximum amount permitted by applicable law;

5. Statutory pre-judgment and post-judgment interest on the Class damages;

6. Injunctive and declaratory relief;

7. Payment of reasonable attorneys' fees and costs as may be allowable under applicable law; and

8. Such other relief as the Court may deem just and proper.

DEMAND FOR JURY TRIAL

Plaintiff hereby demands a trial by jury on all causes of action so triable.

LOCAL CIVIL RULE 11.2 CERTIFICATION

The undersigned hereby certifies that the matter in controversy is not the subject of any other action pending in any court, or of any pending arbitration or administrative proceeding.

DATED: August 30, 2022
Ocean, New Jersey

POULOS LOPICCOLO, PC

By: **/s/** *Joseph LoPiccolo*

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EXHIBIT A

interlogix
A UTC Fire & Security Company

Concord 4 Installation Guide

Content

Contact information

For contact information, see www.utcfireandsecurity.com or www.interlogix.com.

For technical support, toll-free: 888.437.3287 in the US including Alaska, Hawaii, Puerto Rico, and Canada. Outside the tool-free area, contact your dealer.

Description

This is the Installation Guide for the following Concord 4 control panel models:

- 600-1021-95R Concord 4 RF
- 600-1022-95R Concord Express V4
- 600-1040 Concord Commercial V4
- 600-1042 Concord Hybrid

This manual provides information for installing a basic UL Listed Fire and Security System. To modify or use for other purposes, visit the UTC Fire & Security website for additional instructions and training.

Table 1 below shows the standard panel capabilities.

Table 1: Panel capabilities

Capabilities	Concord Express v4	Concord 4/Concord Commercial v4
Zones	32	96
Partitions	2	6
Bus devices	16	16
User codes	16	230

Table 2 below describes the basic panel (out-of-box) hardware capabilities for all panels:

Table 2: Panel hardware capabilities

Power	Input for an AC step-down, plug-in style transformer.
Auxiliary power output	Output that supplies 9 to 14 VDC with up to 1 amp for bus devices and hardwired detectors, such as smoke and motion detectors.
Bus A and B	Input and output that provides communication between bus devices and the panel.
Siren driver	Output that can drive an 8-ohm load and provides intrusion and fire alarm sounds for partition 1 (6 watts maximum).
Two onboard outputs	Can be used to activate other signaling devices based on system events. Out 1 is a 9 to 14 VDC source output, limited to 1.0 amp maximum. Out 2 is an open-collector output, rated up to 14 VDC, 300 mA maximum.
Microphone input	Input used for two-way audio when used in conjunction with the Interrogator 200 audio verification module.
Eight supervised hardwired zones	Inputs for various hardwired detectors. Zone 8 can be set up in programming to accept two-wire smoke detectors. It sources 9 to 14 VDC, 90 mA maximum.
Built-in RF receiver	Allows use of up to 96 or 32 319.5 MHz crystal and/or SAW learn mode wireless sensors and touchpads.

Phone line connection	Allow s panel to communicate w ith central monitoring station and/or pagers.

Note: The total current sourced from all terminals cannot exceed 1 amp.

Panel location

Before permanently mounting the panel, use the following guidelines to choose a mounting location.

- To help reduce wire run lengths and labor, centrally locate the panel with relation to detection devices whenever possible.
- Locate the panel where the temperature will not exceed 120°F (49°C) or fall below 32°F (0°C).
- To prevent wire runs from picking up electrical noise, avoid running wires parallel with electrical wiring or fixtures such as fluorescent lighting.
- Mount the panel at a comfortable working height.
- Leave at least 24 inches in front of the panel to open the cabinet door and access the panel.
- Leave space to the left and right of the panel for wiring, phone jack, and mounting optional modules.
- Leave at least 9 inches above the panel cabinet for antennas.

Power and wire length

The panel can supply up to 1 amp (1,000 mA) in full load alarm condition for system devices connected to panel terminals 4 (+12V), 7 and 8 (speaker terminals), 9 (OUT1), 11 (+12V), 24 (2W SMK ZONE 8), and SnapCard terminals.

For 24-hour backup, the total standby current draw for all devices connected to panel terminals 4 (+12V), 9 (OUT1), 11 (+12V), 24 (if configured for two-wire smoke loop), and SnapCard terminals is limited to 90 mA (during normal standby condition) using a 4.5 or 5.0 Ah battery, or 190 mA (during normal standby condition) using a 7.0 Ah battery.

The total system wire length allowed can vary depending on devices powered by the panel, the wire length between devices and the pane, and the combined wire length of all devices.

Table 3 below describes the maximum wire length allowed between compatible devices and the panel, and the minimum and maximum current draw of each device.

Table 3: Wire length requirements

Device	Max. wire length to panel	Standby mA draw	Alarm mA draw
SuperBus 2000 2x16 LCD alphanumeric touchpad	22 ga.: 300 ft. 18 ga.: 750 ft.	15 mA	90 mA
SuperBus 2000 ATP 1000 alphanumeric touchpad	22 ga.: 300 ft. 18 ga.: 750 ft.	12 mA	110 mA
SuperBus 2000 ATP 2100 alphanumeric touchpad	22 ga.: 300 ft. 18 ga.: 750 ft.	30 mA	165 mA
SuperBus 2000 ATP 2600 alphanumeric touchpad	22 ga.: 300 ft. 18 ga.: 750 ft.	30 mA	165 mA
SuperBus 2000 GTS 50	22 ga.: 100 ft. 18 ga.: 250 ft.	270 mA	300 mA
SuperBus 2000 fixed display touchpad	22 ga.: 300 ft. 18 ga.: 700 ft.	11 mA	65 mA
SuperBus 2000 FTP 1000 fixed display touchpad	22 ga.: 300 ft. 18 ga.: 700 ft.	12 mA	75 mA
SuperBus 2000 RF transceiver	22 ga.: 1,000 ft. 18 ga.: 2,500 ft.	45 mA	55 mA
SuperBus 2000 RF receiver [1]	22 ga.: 1,100 ft. 18 ga.: 2,800 ft.	35 mA	35 mA
SuperBus 2000 phone interface/voice module	22 ga.: 40 ft. 18 ga.: 120 ft.	25 mA	600 mA
SuperBus 2000 voice-only module	22 ga.: 40 ft. 18 ga.: 120 ft.	20 mA	300 mA (jumper) 600 mA (no jumper)
SuperBus 2000 2 amp pow er supply	N/A	No load	No load
4 input/2 output SnapCard	N/A	20 mA	185 mA [1]
8Z hardw ired zone expander SnapCard	N/A	38 mA	230 mA [1]
4 output SnapCard	N/A	1 mA	130 mA [1]
SuperBus 2000 8Z input module	22 ga.: 1,800 ft. 18 ga.: 4,000 ft.	18 mA	35 mA
SuperBus 2000 4-relay output module	22 ga.: 350 ft. 18 ga.: 900 ft.	12 mA	180 mA
SuperBus 2000 energy saver module	22 ga.: 1,600 ft. 18 ga.: 4,000 ft.	20 mA	20 mA
SuperBus 2000 cellular backup module	Standard pow er 22 ga.: 15 ft. 18 ga.: 40 ft. High pow er 22 ga.: 10 ft. 18 ga.: 30 ft.	90 mA 90 mA	1600 mA 1900 mA
SuperBus 2000 automation module	22 ga.: 1,500 ft. 18 ga.: 4,000 ft.	30 mA	35 mA
SuperBus 2000 w ireless gatew ay-ready kit	22 ga.: 40 ft. 18 ga.: 90 ft.	65 mA	1600 mA
Interrogator 200	22 ga.: 3,200 ft. 18 ga.: 4,500 ft.	10 mA	10 mA

Device	Max. wire length to panel	Standby mA draw	Alarm mA draw
Interrogator AVM	22 ga.: 110 ft. 18 ga.: 260 ft.	45 mA	300 mA
Two-wire smoke detectors (429AT, 429C, 429CT, 521B, 521BXT, 521NCSXT	22 ga.: 330 ft. 18 ga.: 330 ft.	70 uA	60 mA
Two-wire smoke detectors (systemsensor 2400, 2400TH)	22 ga.: 330 ft. 18ga.: 330 ft.	120 uA	80 mA
Hardwired interior siren (13-949)	22 ga.: 750 ft. 18 ga.: 1,500 ft.	0 mA	85 mA
Piezo dynamic exterior siren (13-060)	22 ga.: 750 ft. 18 ga.: 1,500 ft.	0 mA	150 mA
Speaker siren (60-528 or 13-060)	18 ga.: 100 ft.	0 mA	500 mA

[1] Maximum current draw for the SnapCards does not include the load which may be applied to their auxiliary DC supply.

Note: When installing SuperBus 2000 RF receiver modules, the antenna tamper feature must be set to off.

Table 4 below describes the total system wire lengths allowed for all SuperBus 2000 devices when installing systems using unshielded or shielded cable. The maximum wire length for individual devices is shown instable below.

Table 4: Total system wire lengths

Wire type	Total system wire
18-gauge, unshielded	4,000 ft.
18-gauge, shielded	3,000 ft.
22-gauge, unshielded	4,000 ft.
22-gauge, shielded	3,000 ft.

After determining panel location, run all necessary wires to that location using the guidelines in Table.

Table 5: Device wire requirements

Device	Wire requirements
AC power transformer	2-conductor, 18-gauge, 25 ft. max.
Earth ground	Single conductor, 16-gauge solid, 25 ft. max.
Telephone (RJ-31X)	4-conductor
Detection devices	2- or 4-conductor, 22-gauge, 1,000 ft. max. 2- or 4-conductor, 18-gauge, 2,500 ft. max. (based on 30 ohms max. loop resistance including device)
Speakers	2-conductor, 18-gauge, 100 ft. max.
SuperBus 2000 devices	4-conductor, 22- or 18-gauge
Interrogator 200 AVM power and microphone	4-conductor, 22-gauge, shielded
Two-wire smoke detectors	2-conductor, 22-gauge, 330 ft. max. 2-conductor, 18-gauge, 830 ft. max.

Mounting the panel

Mount the panel to the wall or wall studs.

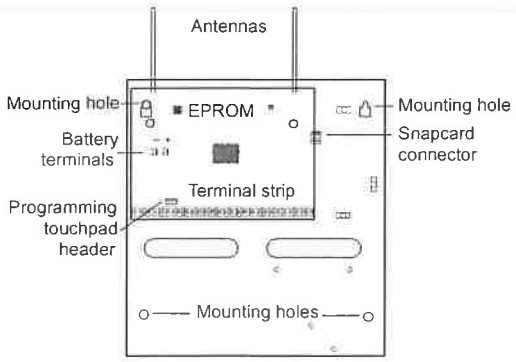
Caution: Make sure you are free of static electricity whenever you work on the panel with the cover open. To discharge any static, first touch the metal panel chassis, and then stay in contact with the chassis when touching the circuit board. We recommend using a grounding strap.

To mount the panel:

1. Remove the panel door and remove the necessary wiring knockouts. Be careful not to damage the circuit board.
2. Feed all wires through wiring knockouts and place the panel in position against the wall.
3. Level the panel and mark the top and bottom mounting holes.
4. Install anchors where studs are not present.
5. Partially insert screws into the two top mounting hole locations, then hang the panel on the two screws.
6. Recheck for level, insert the two lower screws, and tighten all four mounting screws.

Figure 1 below shows the main component locations.

Figure 1: Panel components



Grounding the panel

For maximum protection from lightning strikes and transients, connect the enclosure to earth ground. Use 16-gauge, solid copper wire from an earth grounded cold water pipe clamp to the enclosure. For best results, we recommend that you crimp a spade lug on the wire end at the panel and secure the lug to the enclosure.

Antenna shrouds

Install a plastic antenna shroud (included with the panel) over each antenna and snap them into the holes on top of the enclosure (skip this step for hybrid and commercial systems).

Programming

For onsite system programming, you must have an alphanumeric touchpad.

You must use an installer/dealer code (default 4321) to enter program mode. You may place the system into programming mode only when you disarm all partitions.

Note: If the system is powered up after the programming touchpad is connected or if a bus command scan is executed, the programming touchpad will be learned (programmed) into the system and must later be manually deleted.

To enter program mode:

1. Make sure you disarm the system in all partitions.
2. Press 8, 4321, 0, 0.

   The display shows `SYSTEM PROGRAMMING`.

To enter program mode using a programming touchpad:

1. Connect the red, black, green, and white wires from the programming touchpad cable (60-791) to the power and bus wires/terminals on an alphanumeric touchpad, matching the +12V (red), Bus A (green), Bus B (white), and GDN (black) on each.
2. Make sure the system is powered up and disarmed.
3. Connect the plug on the cable onto the panel programming touchpad header.
4. Press 8, 4321, 0, 2.

   The touchpad sounds one short beep.
5. Press * and verify that the display shows `SERVICE TOUCHPAD ACTIVE`.
6. Press 8, 4321, 0, 0.

   The display shows `SYSTEM PROGRAMMING`.
7. After programming is complete, disconnect the touchpad from the panel header.

Touchpad programming options

In program mode, touchpad buttons let you navigate to all installer programming menus for configuring the system.

Table 6 below describes the touchpad button functions in program mode.

Table 6: Touchpad programming functions

Button	Programming function
#	Select menu item or data entry.
*	Deselect menu item or data entry (if pressed before #).
A (▲) B (▼)	Scroll through available option at the current menu tier. Scroll through sensor text options during sensor text programming.
C	Enter pauses when programming phone numbers.
D	Delete certain programming settings.
0 to 9	Enter numeric values wherever needed.
1 and 2	Select off (1) or on (2) wherever needed.
1 to 6	Press and hold to enter alphabetical characters A through F for account numbers.
7 and 9	Press and hold to enter * (7) or # (9) for phone numbers.

Menu navigation

There are two basic tiers of programming menus, tier 1 and tier 2.

From the tier 1 System Programming menu, you can access the following tier 2 programming menus:

- Security
- Phones
- Phone options
- Timers
- Light controls
- Touchpad options
- Reporting
- Siren options
- Sensors
- Audio verification
- Accessory modules
- Onboard options
- Macro keys

Only when the display shows SYSTEM PROGRAMMING can you advance to tier 2 programming menus.

Press B or # to advance forward through menus. Press A or * to move backward through the menus.

Only when a specific menu is displayed can you advance to those menu settings. For example, from the SENSORS display, pressing # gives you access to learning sensors, programming sensor text, deleting sensors, and viewing/editing sensor programming.

To exit program mode:

1. Press * until the display shows SYSTEM PROGRAMMING.
2. Press A or B until the display shows EXIT PROGRAMMING READY.
3. Press # and the touchpad displays the time and date.

Sensors menu

The Sensors menu gives you access to the following settings:

- **Learn sensors.** Add (learn) hardwired zones, wireless sensors, and wireless touchpads into panel memory.
- **Sensor text.** Name the sensors and zones you have added to the system.
- **Delete sensors.** Delete zones and sensors from panel memory.
- **Edit sensors.** View or change a sensor group or partition assignment. You can also identify whether a zone is wireless or hardwired, whether it is configured as normally closed (NC) or normally open (NO), and whether the zone is a touchpad.

Table 7 below describes how to trip different types of sensors to program (learn) them in the panel.

Table 7: Tripping sensors

Sensor	How to trip the sensor
Hardwired zones	Start with the zone in its normal state, and then trip the zone into its alarm state. A normally closed door, for example, should be closed when you begin the learn sensors process. To trip the zone, open the door.
Wireless sensors	Follow the instructions included with each sensor.
Wireless door/window sensors with external contacts	Place the external contact in the alarm condition, and then activate the sensor tamper switch.
Self-actuated bells	Activate the tamper switch.
Handheld wireless touchpads	Press the BYPASS button.
Key fobs *	Press and hold the lock and unlock buttons together until the key fob LED flashes.
ELM key fobs *	Press and release the unlock button twice quickly, then press and hold until the LED flashes three times. Press and release the unlock button once quickly, then press and hold until the LED flashes two times. Press and hold the unlock button until the LED flashes once.

* Key fobs have not been investigated by UL for use in a UL Listed installation.

Learn sensors

The default setting is "None".

The panel comes with factory programmed onboard hardwired zones. Install 2 kohm, end of line (EOL) resistors on all unused factory sensors shown above and hardwired zones. If you don't want to install EOL resistors, delete any unused zones from memory. See Table on page 6 for onboard hardwired zone factory programming. Sensors must be placed in a partition or sensor group. To change the sensor group or partition assignment after adding a sensor or zone, use the Edit Sensors menu.

To add (learn) sensors into panel memory:

1. With the display showing SENSORS, press #.

   The display shows LEARN SENSORS.
2. Press #.

   The display shows SENSOR PTN 1.
3. Press # to select partition 1 or press 2, 3, 4, 5, or 6 and then press # to select the desired partition.

   The display shows SENSOR GROUP 0.
4. Enter the sensor group and press #. (See Table for a description of all sensor group characteristics.)

   The display shows TRIP SENSOR nn, where nn is the displayed (next available) sensor number.
5. To change the displayed sensor number, enter the desired sensor number and press #.

   The desired sensor number is displayed.
6. With the desired sensor number displayed, use the guidelines in Table 6 to force the sensor or zone you

are adding (learning) into the panel memory to send a signal to the panel.

7. To add another sensor to the same sensor group and partition, repeat the process.
8. To add sensors to another sensor group or partition, press * twice and repeat the process.

Table 8 below describes the factory default zone inputs.

Table 8: Zone factory programming

Zone input	Group number and description
1	10 - entry/exit
2	17 – instant interior follower
3	13 – instant perimeter
4	13 – instant perimeter
5	13 – instant perimeter
6	13 – instant perimeter
7	13 – instant perimeter
8	13 – instant perimeter

If the panel memory is cleared, all onboard hardwired zone factory programming will be cleared.

Quick programming mode

Use the quick programming mode to program basic system programming with a SuperBus 2000 fixed display touchpad, SuperBus 2000 FTP 1000 touchpad, or any SuperBus 2000 alphanumeric touchpad. The following menus are accessible:

- Account number (all partitions)
- SC phone 1
- CS phone 2
- CS phone 3
- Learn sensors (limited to selecting sensor number, sensor group, and partition assignment). An alphanumeric touchpad is required for programming sensor text in standard programming mode.

Use the A and B buttons to toggle across main menus and use the # and * buttons to toggle up and down through the submenus.

To enter quick programming mode:

1. Make sure the system is disarmed in all partitions.
2. Press 8, enter the installer/dealer code, and then press 03.

   The display shows ACCOUNT NUMBER.
3. Cycle through the menus as shown in Table 9 below.

Table 9: Quick programming menu structure

Account number	Partition number 1 to 6
	Account number 00000
CS phone	CS phone 1
	CS phone none
	CS phone 2
	CS phone none
	CS phone 3
	CS phone none
Learn sensors	Sensor partition number 1 to 6
	Sensor group 0
	Trip sensor number 1 to 96
End programming	

Sensor group characteristics

Table 10 below shows what the sensors on your Concord 4 system do. Every sensor is assigned to a group, and this table specifies those groups and functions. Every device must be assigned to one of these groups.

Note: The "X" marks in the table represent characteristics present in a group.

Table 10: Sensor group characteristics

Number	Name	Application	Alarm	Delay	Restoral	Supervisory	CS report	Chime (level)	Active (level)
00	Fixed panic	24-hour audible fixed emergency buttons	Police	Instant		X	X		1, 2, 3
01	Portable panic	24-hour audible portable emergency buttons	Police	Instant			X		1, 2, 3
02	Fixed panic	24-hour silent fixed emergency buttons	Silent	Instant		X	X		1, 2, 3
03	Portable panic	24-hour silent portable emergency buttons	Silent	Instant			X		1, 2, 3
04	Fixed auxiliary	24- hour auxiliary sensor, such as pendant panic or holdup button	Auxiliary	Instant		X	X		1, 2, 3
05	Fixed auxiliary	24-hour auxiliary emergency button, siren shutoff confirms CS report	Auxiliary	Instant		X	X		1, 2, 3
06	Portable auxiliary	24-hour portable auxiliary alert button	Auxiliary	Instant			X		1, 2, 3
07	Portable auxiliary	24-hour portable auxiliary button, siren shutoff confirms CS report	Auxiliary	Instant			X		1, 2, 3
08	Special intrusion	Special belongings, such as gun cabinets and wall safes	Police	Instant	X	X	X		1, 2, 3
09	Special intrusion	Special belongings, such as gun cabinets and wall safes	Police	Standard	X	X	X		1, 2, 3
10	Entry/exit delay	Entry and exit doors that require a standard delay time	Police	Standard	X	X	X	X	2, 3
11	Supplementary Extended Delay	Garage doors and entrances that require extended delay time [1,5]	Police	Extended	X	X	X	X	2, 3
12	Supplementary Extended Delay	Driveway gates and entrances that require a twice extended delay time [1,5]	Police	Twice extended	X	X	X	X	2, 3
13	Instant perimeter	Exterior doors and windows	Police	Instant	X	X	X	X	2, 3
14	Instant interior	Interior doors (hardwired)	Police	Follower	X	X	X		2, 3
15	Instant interior	Interior PIR motion sensors [1] (RF wireless)	Police	Follower		X	X		2, 3
16	Instant interior	Interior doors (hardwired)	Police	Follower	X	X	X		3
17	Instant interior	PIR motion sensors 1 (RF wireless)	Police	Follower		X	X		3
18	Instant interior	Instant interior cross-zone # PIR motion sensors [1, 2]	Police	Follower		X	X		3

Number	Name	Application	Alarm	Delay	Restoral	Supervisory	CS report	Chime (level)	Active (level)
19	Delayed interior	Interior doors that initiate a delay before going into alarm [1]	Police	Interior	X	X	X		3
20	Delayed interior	PIR motion sensors that initiate a delay before going into alarm [1]	Police	Standard		X	X		3
21	Local instant interior	24-hour local alarm zone protecting anything that opens and closes	Police	Instant	X	X			1, 2, 3
22	Local delayed interior	Same as group 21, plus activation initiates a delay before going into alarm	Police	Standard	X	X			1, 2, 3
23	Local instant auxiliary	24-hour local alarm zone protecting anything that opens and closes [3]	Auxiliary	Instant	X	X			1, 2, 3
24	Local instant auxiliary	24-hour local alarm zone protecting anything that opens and closes, sirens shut off at restoral [1]	Auxiliary	Instant	X	X			1, 2, 3
25	Local special chime	Notify the user when a door is opened, sounds emit from a local annunciator [1]	Special chime	Instant		X			1, 2, 3
26	Fire	24-hour fire, rate-of-rise heat, and smoke sensors	Fire	Instant	X	X	X		1, 2, 3
27	Output module	Hardwired output module (HOM) lamp control or other customer features [3]	Silent	Instant	X	X			1, 2, 3
28	Output module	HOM, PIR motion sensor, sound sensor, or pressure mat [3]	Silent	Instant		X			1, 2, 3
29	Auxiliary	Freeze sensor	Auxiliary	Instant	X	X	X		1, 2, 3
32	Output module	HOM, PIR motion sensor, sound sensor, or pressure mat [3]	Silent	Instant					1, 2, 3
33	Siren	Wireless siren supervision	Silent	Instant		X	X		1, 2, 3
34	Gas	Carbon monoxide (CO) gas detectors [3]	Auxiliary	Instant	X	X	X		1, 2, 3
35	Local instant police (day zone)	Local alarm levels 1 and 2, report to CS in level [3]	Police	Instant	X	X	X (level 3 only)		1, 2, 3
38	Auxiliary	Water sensor [3]	Auxiliary	Instant	X	X	X		1, 2, 3

1. This group is not certified as a primary protection circuit for UL-listed systems and is for supplementary use only.
2. Sound instant police siren if two or more sensors are tripped within 4 minutes. Otherwise sensors are followers to delayed sensors. If Alarm Verification is on, group 18 functions like group 17.
3. This group has not been investigated by UL.
4. ~~This group is required for UL-listed residential fire alarm applications.~~
5. Does not satisfy Auto Stay Arming exit requirement.

Specifications

Power requirements	Class 2, 16.5 VAC, 40 VA, 60 Hz (600-1023 or 600-1024) Rechargeable battery: 12 VDC, 4.5 or 5.0 Ah lead-acid (60-681) or 12 VDC, 7 Ah (60-680). The battery will last 24 hours with no AC and specified stand-by load.
Auxiliary power output	1.0 A at 9 to 14 VDC (12 VDC typical)
Radio frequency	319.5 MHz
Nominal RF range	1,000 feet (305 m) typical open air
Storage temperature	-30 to 140°F (-34 to 60°C)
Operating temperature	32 to 120°F (0 to 49°C)
Maximum humidity	85% relative humidity, noncondensing
Dimensions (H x W x D)	14 x 12 x 3 in. (35.6 x 30.5 x 7.6 cm)

Regulatory information

UL listed installations

This section describes the requirements for UL listed installations.

Basic system:

- Control panel (600-1021-95R Concord 4 RF, 600-1022-95R Concord Express V4, 600-1040 Concord Commercial V4, or 600-1042 Concord 4 Hybrid).
- Standard class 2 16.5 VAC, 40 VA power transformer 22-145 or 22-156 (600-1023), 22-156-CN, or 22-145-CN (600-1023-CN), or power line carrier class 2 16.5 VAC, 40 VA power transformer 22-149 (600-1024) or 22-149-CN (600-1024-CN). You must order these transformers separately from UTC Fire & Security.
- Backup battery 12 V 4.5 or 5.0 Ah (60-681) or 12 V 7 AH (60-680).
- SuperBus 2000 fixed display touchpad (60-820), FTP 1000 (600-1020), 2x16 LCD touchpad (60-746-01), ATP 1000 (60-983), ATP 2100 (60-985), ATP 2600 (60-984), 2x20 LCD touchpad (60-803), or 2x20 VFD touchpad (60-804).
- Interior speaker siren (60-528), hardwired interior siren (13-949), or speaker siren (13-060).
- Basic system but also include a SuperBus 2000 RF receiver (60-764-95R-01) or a SuperBus transceiver (600-1025-01-95R).

Household burglary alarm system unit (UL 1023)

Basic system plus the following:

- Hardwired magnetic contact (13-068 or 13-071) or wireless learn mode door/window sensor (60-362)
- Immediate beeps set to on.
- UL 98 options set to on.
- Receiver failure set to on (if wireless devices are used).
- Siren verify set to on.
- Exit delay set to 60 seconds.
- Quick exit set to off.
- Siren timeout set to 4 minutes or more.
- Entry delay set to 45 seconds or less.
- RF TX timeout set to 24 hours (if system includes built in receiver or SuperBus 2000 RF receiver or SuperBus 2000 RF transceiver and wireless burglary sensors).
- Extended delay set to off.
- Sleep time set to off.
- Two trip error set to off.
- Alarm verify set to off.
- Disable trouble beeps set to off.

Household fire warning system (UL 985)

Basic system plus the following:

- Wireless smoke sensor 60-506-319.5, 60-848-02-95, or TX-6010-01-1 learned into sensor group 26.
- Immediate beeps set to on.
- UL 98 options set to on.
- Receiver failure set to on (if wireless devices are used).
- Siren verify set to on.
- Sleep time set to off.
- Siren timeout set to 4 minutes or more.
- Two-trip error set to off.
- Disable trouble beeps set to off.
- RF TX timeout set to 4 hours (if system includes built in receiver or SuperBus 2000 RF transceiver and wireless smoke sensors).

UL 1023 and 985 24-hour backup

For 24-hour backup, the total current draw for all connected devices is limited to 90 mA (during normal standby conditions) using a 4.5 or 5.0 Ah battery, or 190 mA (during normal standby conditions) using a 7.0 Ah battery.

SIA system requirements

SIA system requirements are the same as those described for a UL-listed basic system. If multiple annunciation is required, use additional touchpads. This applies to model numbers 60-746-01, 60-803, 60-804, 60-820, 60-983, 60-984, 60-985, and 600-1020. UL requirements take priority over SIA requirements.

Table 11 on page 10 describes programming requirements to meet ANSI-SIA CP-01.

Table 11: SIA setting requirements

Function	Default setting	Required setting
Exit extension	On	On
Duress code	Disabled	Disabled
Dialer abort delay	30 seconds	15 to 45 seconds
Cancel message	On	On
Call w ait cancel	Disabled	On if reporting to central station and customer has call w aiting service.
Entry delay	30 seconds	30 to 240 seconds
Exit delay	60 seconds	45 to 184 seconds
Swinger limit	1	1
Smoke verify	Off	On if smoke alarms are programmed into system.
Cross zone	Disabled	Enabled for zones w ith high probability of false alarms

Table 12 below describes nonprogrammable (hard-coded) system operation, as required to meet ANSI-SIA CP-01 and is provided only for your reference.

Table 12: ANSI-SIA CP-01 requirements

Function	Operation
SIA false alarm	Enabled
Auto stay arming[1]	Enabled
Disarm during entry delay	Enter code only (or 1 + CODE)
Cancel alarm	Enter code only (or 1 + CODE).
Abort annunciation	Enabled
Exit error	Enabled
Entry/exit progress annunciation[2]	Enabled

Notes:

1. Auto Stay Arming is attached to "Standard" entry/exit delays. (Please refer to table 10,"delay" column).

2. You may use the silent arming feature to suppress arming level and exit beeps for the current arming period. Refer to the Concord 4 user manual for more information on silent arming.

Commercial burglary alarm system unit (UL 1610)

Basic system using control panel 600-1040, SuperBus 2000 RF transceiver module (600-1025-01-95R), plus the following:

- Hardwired magnetic contact (13-068 or 13-071) or wireless learn mode door/window sensor (60-499).
- SAW PIR sensor (60-639-95R), crystal PIR sensor (60-703-95R), or DS924i PIR sensor (60-511-01-95).
- UL approved bell/housing, such as Ademco #AB12M or equivalent.
- Immediate beeps set to on.
- UL 98 options set to on.
- Receiver failure set to on (if wireless devices are used).
- RF TX timeout set to 4 hours.
- 24-hour tamper set to on.
- System tamper set to on.
- Automatic phone test set to on.
- Phone text frequency set to 1.
- Next phone test set to 1.
- Siren verify set to on.
- AC failure set to on.
- Exit delay set to 120 seconds or less.
- Quick exit set to off.
- Two-trip error set to off.
- Alarm verify set to off.
- Disable trouble beeps set to off.
- Phone number must be programmed.
- High level reports set to on.
- Low level reports set to on.
- Communication failure set to on.
- Extended delay set to off.
- Sleep time set to off.
- Siren timeout set to 4 minutes or more.

UL 1610 24-hour backup

Same as UL 1023 and 985.

UL 1635 digital alarm communicator system

For UL 1635 installations, entry delay plus dialer abort delay must not exceed 60 seconds. Same as UL 1023, 985, and 1610 plus:

- AC failure set to on.
- Phone number must be programmed.
- Low CPU battery set to on.
- Next phone test set to 1.
- Phone test frequency set to 1.
- High level reports set to on.
- Low level reports set to on.
- Communication failure set to on.
- RF TX timeout set to 4 hours.

Central station reporting

The panel has been tested with the following central station receivers using SIA and Contact ID reporting formats:

- CS-5000 central station receiver
- Sur-Gard central station receiver with models SG-DRL2A and SG-CPM2
- Osborne Hoffman central station receiver

Note: The installer must verify the compatibility between this panel and the central station receivers being used.

UL Canada listed installations

This section describes the requirements for CUL (UL Canada) listed installations.

Residential burglary alarm system unit (ULC subject C1023-1974)

Basic system as described for UL 1023 listed installations plus:

- Hardwired magnetic contact (13-068 or 13-071) or wireless learn mode door/window sensor (60-362)
- Siren timeout set to 5 minutes or more

Residential fire warning system control unit (ULC-S545-M89)

Basic system as described for UL 985 listed installations plus:

- Hardwired smoke detector: System sensor models 2400 or 2400TH learned into sensor group 26, or ESL models 429AT, 429CT, 521B, 521BXT, 521NCSXT, 711U, 711UT, 721U, 721UT, TS7-2, or TS7-2T learned into sensor group 26.
- Wireless smoke sensor 60-319.5 60-848-02-95, TX-6010-01-1 learned into sensor group 26.
- Siren timeout set to 5 minutes or more.
- RF TX timeout set to 4 hours (if system includes SuperBus 2000 RF transceiver and wireless smoke sensors).
- Immediate trouble beeps set to on.

Note: For 24-hour backup, external power drain is limited to 90 mA (during normal standby condition) using a 4.5 or 5.0 Ah battery, or 190 mA continuous using a 7.0 Ah battery.

California State Fire Marshall listed installations

Same as Household Fire Warning System (UL 985) plus:

- Smoke verify must be set to off.

FCC compliance

Changes or modifications not expressly approved by UTC Fire & Security can void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, of not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

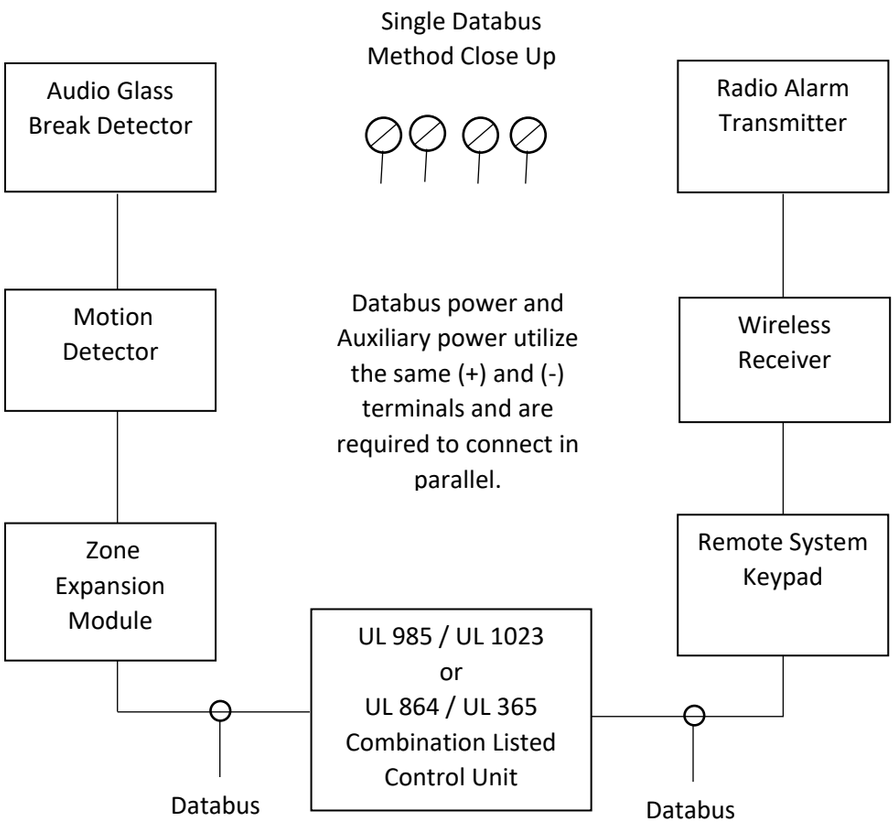
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the affected equipment and the panel receiver to separate outlets, on different branch circuits.
- Consult the dealer or an experienced radio/TV technician for help.

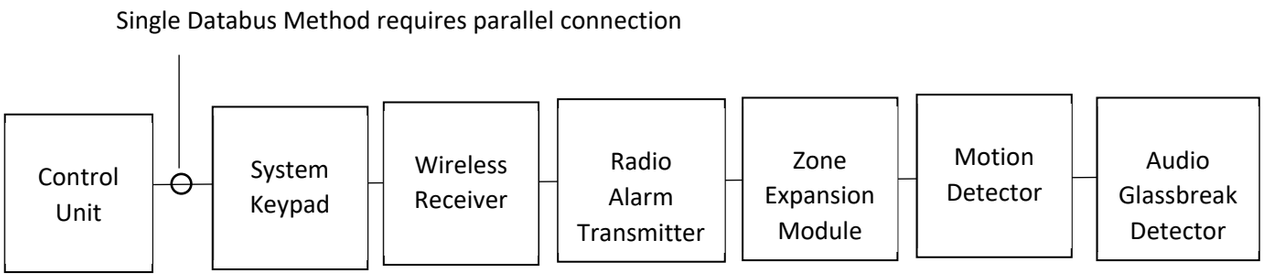
Part 68. This equipment complies with Part 68 of the FCC rules. Located on this equipment is a label that contains, among other information, the FCC registration number and the ringer equivalence number (REN) for this equipment. If requested, this information must be provided to the telephone company.

FCC Part 68 registration number: US: B4ZAL02B55910.

EXHIBIT B



All Databus connected devices are required to be connected in parallel with each other and throughout the protected premises.



A short circuit condition being introduced anywhere onto the Databus will cause the Combination Listed Control Unit to instantly fail.

EXHIBIT C

UL Standards Matrix
UL® 985-Household Fire Warning System Units, 5th Edition and
The 6th Edition Effective May 15th, 2019

Standard References	5th Edition May 26, 2000	6th Edition May 15, 2015
Combination Control Unit	Not included in this edition of the standard	41.3
Short circuit or open circuit single faults in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall* not impede or impair the monitoring for integrity of the fire alarm system, nor impede or impair any fire alarm signal transmissions or operations.	Not included in this edition of the standard	41.3.1.3
The required operation of the fire alarm equipment shall* not be impaired by any failure of the non-fire alarm equipment hardware, software or circuits, or by any maintenance procedure, including removal or replacement of defective equipment or powering down of the non-fire equipment.	Not included in this edition of the standard	41.3.1.6
Electrical Supervision Test	41	Not Included in this edition of the standard.
An open or ground fault in any circuit extending from a household control unit, other than the initiating device circuit, shall* not affect the operation of the control unit except for the loss of the function extending from that circuit.	41.4	Not Included in this edition of the standard.
A fault condition, open ground, or short of other than a fire alarm circuit of a combination control unit shall* not affect the fire-alarm signaling.	41.6	Not Included in this edition of the standard.
Keypads	Not included in this edition of the standard	44.4
Keypads and other operator interfaces shall* be monitored for integrity so that within 200 seconds a distinctive audible trouble signal will indicate the occurrence of a single break (open) or single ground fault in the interconnections, which would prevent the intended operation of the system for alarms, alarm transmissions to a supervising station, or the signal representative of a failure to complete a signal transmission with a supervising station. The trouble annunciation shall* be at an operator interface or audible at the operator interface. Prior to the application of a fault the control unit shall* be energized in the intended standby condition while connected to a rated source of voltage and frequency. Exception: Supervision is not required for keypad interconnections to the control unit extending not more than 3 feet (0.91 m) from the control unit.	Not included in this edition of the standard	44.4.1
Annunciation of the audible trouble signal required by 44.4.1 is permitted to be remote from an operator interface, when the product's installation instructions alert the user that the product sounding the audible is to be installed in a location where the audible signal can be heard at the operator interface.	Not included in this edition of the standard	44.4.2

*The word "shall" indicates a mandatory requirement.

NFPA 72 Code Matrix
NFPA 72® -National Fire Alarm Code
NFPA 72®-National Fire Alarm And Signaling Code

Code References	2019 Edition	2016 Edition	2013 Edition	2010 Edition	2007 Edition	2002 Edition
Faults in other systems or components shall* not affect the operation of the fire alarm system	29.10.7.5	29.7.7.4	29.7.7.4	29.7.6.4	11.7.6.4	11.7.6.4
Where common wiring is employed for a combination system, the equipment for other than the fire alarm system shall* be connected to the common wiring of the system so that short circuits, open circuits, grounds, or any fault in this equipment or interconnection between this equipment and the fire alarm system wiring does not interfere with the supervision of the fire alarm system or prevent alarm or trouble signal operation.	29.10.7.6	29.7.7.5	29.7.7.5	29.7.6.5	11.7.6.5	11.7.6.5
Equipment not required for the operation of the fire alarm system that is modified, removed, or malfunctioning in any way must not impair the operation of the fire alarm system. Commentary Text from NFPA 72® Handbook	29.10.7.6	29.7.7.5	29.7.7.5	29.7.6.5	11.7.6.5	11.7.6.5

UL Standards Matrix
UL® 1023- Household Burglar-Alarm System Units

Standard References	6th edition November 25, 1996	7th edition September 1, 2017
Electrical Supervision Test	27	30
An open or ground fault in any circuit extending from a household system unit, other than the initiating device circuit, shall* not affect the operation of the product except for the loss of the function extending from that circuit. Exception: If such a fault will affect the operation of the product, a trouble signal or alarm condition or test feature that will indicate the fault is required.	27.2	30.2
A fault condition, open ground, or short of other than a burglar-alarm circuit of a combination control unit, shall* not affect the burglar-alarm signal.	27.3	30.3

*The word “shall” indicates a mandatory requirement.

EXHIBIT D

From: NFPA Electrical <techqueselec@nfpa.org>
Sent: Tuesday, September 21, 2021 3:09 PM
To: Jeffrey Zwirn <jeffzwirn@alarmexpert.com>
Subject: NFPA Technical Question Response ref# [ref:_00D5077Vx._5001T1YrrnG:ref]

You are correct that a failure in another system connected to the fire alarm system cannot affect the function of the fire alarm system. Also, the signals from another system such as a burglar system can not take priority over the life safety signals of the fire alarm system.

Important Notice: Any opinion expressed in this correspondence is the personal opinion of the author and does not necessarily represent the official position of the NFPA or its Technical Committees. In addition, this correspondence is neither intended, nor should it be relied upon, to provide professional consultation or services.

Christopher D. Coache, Senior Electrical Engineer

If you have a follow-up question directly related to this inquiry, please reply to this email. If you have another question on either a separate topic or different document please return to the document information pages and submit your new question by clicking on the "Technical Questions" tab.

Contact: Jeffrey Zwirn
Create Date: 9/17/2021

Document Number: 72
Edition: 2019
Section: 29.10.7.5 and 29.10.7.6
Subject: Combination Listed Household Burg and Fire Control Unit
Question for NFPA:

The equipment manufacturer's specifications of this control unit require the following. The auxiliary DC power output of this control unit is intended to connect to burglar alarm initiating detection devices that require DC Power such as audio glass break detectors and motion detectors. The auxiliary DC power output of this control unit shares the same power terminals as the single data-bus circuit of the control unit.

Therefore, if fire is introduced onto the auxiliary DC power output wiring of this control unit it will cause a short circuit fault condition. Since fire will melt the wiring together, the short circuit condition will be left in a sustained mode. Accordingly, its on-board PTC offers no protection. That said, when a short circuit fault condition is introduced onto the DC auxiliary power output of the control unit it will instantly shut down all zones of the fire alarm system that are connected to the zone expansion module on the system, in that each of the Zone Expansion Module are required to be connected in parallel with the single data-bus circuit of the control unit. It should also be noted that all Honeywell Zone Expansion Modules for this control unit are UL Listed to UL-1023- Household Burg and UL-985- Household Fire.

Against the foregoing backdrop, the information set forth in NFPA 72 at Sections 29.10.7.5[3] and 29.10.7.6. respectively using this control unit does not comply with NFPA 72 Standards in that a fault in the burglar alarm system will affect the operation of the fire alarm system, and equipment for other than the fire alarm system, being the burglar alarm system, that is connected to the common wiring of the system (the single data-bus) will interfere with the supervision of the fire alarm system and/or it will prevent alarm or trouble signal operation because once a short circuit condition is introduced onto the auxiliary power output of the system the zone expansion module(s) referenced above is no longer able to function since it instantly loses DC power.

EXHIBIT E

ANALYSIS OF THE HYPOTHESIZED DATA-BUS FAILURE MODE OF COMBINATION-LISTED FIRE/SECURITY CONTROL UNITS

by

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ABOUT COMBUSTION SCIENCE & ENGINEERING, INC.[1]

Combustion Science & Engineering, Inc. (CSE) is a company that for more than twenty years has been dedicated to the study, advancement, and application of combustion and fire sciences. Combining a wealth of knowledge and experience, from the private to public sector, from academia to industry, CSE's spirited partnership and dedicated team offers exceptional technical leadership, intelligent solutions in combustion and fire protection, and superior fire and explosion investigations. Our corporate capabilities include extensive experience in applying scientific and engineering principles to the analysis of fire and combustion.

The CSE team has advanced degrees in chemistry, chemical engineering, mechanical engineering, fire protection engineering, and aerospace engineering. CSE's main office and laboratory space is conveniently located in Columbia, Maryland, in the heart of the Washington, D.C. - Baltimore corridor. CSE's nearly 19,000 square feet of modern facilities include nearly 1,500 square feet of conditioned lab space, and around 5,000 square feet of high-bay unconditioned space.

[1] More information can be found at https://www.csefire.com/

This report regarding our analysis of an offered failure mode of combination-listed fire/burglar alarm control units is intended to serve as a disclosure of our findings and opinions. This analysis is based on our review to date of documents, evidence, standards, and information concerning the hypothesized failure mode. A list of the specific material reviewed to date is given as Appendix A. It is also based on our laboratory experimentation described herein.

By way of background, Mr. Olenick is a Registered Professional Engineer (P.E.) and holds Bachelors (1998) and Masters (1999) degrees in Fire Protection Engineering from the University of Maryland, College Park. He is a frequent contributor to fire science literature. He is a Principal Member of the Single-and Multiple-Station Alarms and Household Signaling Systems (SIG-HOU) Technical Committee that sets the requirements related to residential smoke and carbon monoxide alarms and fire and carbon monoxide detection systems in NFPA 72®, National Fire Alarm and Signaling Code®. He is also Chair of the new Fuel Gases Warning Equipment Technical Committee (FWE-AAA) responsible for the upcoming first version of NFPA 715, Standard for the Installation of Fuel Gases Detection and Warning Equipment. Additional information on his experience and training is provided in his Curriculum Vitae and Lists of Publications that are given as Appendix B.

Dr. Klassen holds degrees (B.S., M.S., and Ph.D.) in Mechanical Engineering from the University of Maryland and is a Registered Professional Engineer. Dr. Klassen has conducted research and published technical articles on a number of different subjects relating to fire protection, fire science, and combustion during his over 30-year career. Additional information on his experience and training is provided in his Curriculum Vitae and Lists of Publications that are given as Appendix B.

Mr. Switzer holds a Bachelor's Degree in Mechanical Engineering from the University of Maryland and is a Project Engineer with Combustion Science & Engineering, Inc. working on various consulting engineering projects over the past 5 years. He routinely participates in experimental projects and analyses related to combustion and fire science, as well as fire protection engineering. Additionally, he has participated in forensic fire investigation and reconstruction analyses. He is also responsible for UL compliance and technical development for the SafeAwake smoke alarm accessory. Additional information on his experience and training is provided in his Curriculum Vitae and Lists of Publications that are given as Appendix B.

BACKGROUND

Jeffrey Zwirn, President of IDS Research & Development, Inc. (IDS), has indicated that he has uncovered a mode of failure on combination-listed burglar and fire alarm control units that deviates from both UL and NFPA standards. Mr. Zwirn believes that this failure can render these alarm system control units non-functional without proper warning to the occupants, building owners, or the remote station. These control units are represented to be listed to UL standards, and are required to comply with NFPA 72®. Despite the listing, Mr. Zwirn has indicated that an electrical short circuit in equipment connected to the data-bus, including non-fire alarm equipment, and/or in the data-bus wiring itself, instantly renders the fire alarm system non-functional as it hinders an onsite audible alarm response to fire, and it prevents fire alarm signal(s) from being transmitted to the remote monitoring/central station.

For purposes of transparency, Mr. Zwirn was awarded a United States Patent, Protective Device for Alarm Systems Patent Number 9,965,944 BI2018, for rectifying non-conforming combination-listed fire and burglar alarm control units that he has opined do not meet both UL and NFPA standards. Having said that, Combustion Science & Engineering. Inc. (CSE) is not in any way involved in the patent, it has not tested nor evaluated the patented product, nor does it have a financial interest in this invention.

The hypothesized failure identified by Mr. Zwirn can potentially occur because of the common wiring methodology that burglar (security) and fire alarm equipment operate under with combination-listed control units, since both are required to reside on the single data-bus circuit of the control unit. Examples of equipment connected directly or indirectly to the data-bus includes system keypads, the auxiliary DC power output for burglar alarm initiating detection devices (such as motion detectors and audio glass break detectors), wireless radio receiving units, zone expansion modules and wireless radio alarm transmitters (whether they are of the dialer capture method type or of the embedded wireless radio alarm transmitter method type). The schematic for the Honeywell Vista 20P control unit can be seen in Figure 1 demonstrating the large number of devices that are intended to be connected to the data-bus wiring. The list of devices for this particular system is representative of those typically found on the market from Honeywell and a variety of other alarm equipment manufacturers. Mr. Zwirn has indicated that all of this particular

equipment is required to be connected in parallel with all of the other data-bus connected devices and/or that the combination-listed control unit uses the same terminals for its auxiliary DC power output as it does for the power required for the data-bus circuit. In fact, the positive and negative DC power for the control units' auxiliary output and power for the single data-bus wiring reside on the same terminals.

In other words, if a component on the data-bus and/or on its connected common wiring has an electrical short circuit introduced onto it, Mr. Zwirn has hypothesized that it will disable the entire data-bus including any connected keypads, the system's wireless radio receivers, the system's zone expansion modules, the wireless radio alarm transmitter, and any other non-fire related equipment connected to the common wiring of the data-bus. The electrical short circuit condition could be caused by fire burning the data-bus wiring and melting its internal conductors together due to the heat of the fire, or it could be caused by fire directly attacking any of the parallel connected devices that are required to connect to the data-bus for the system to operate properly. According to Mr. Zwirn, since both DC power and data are required to be integral to the single data-bus four (4) conductor cabling that is installed through a protected premises, a short circuit condition introduced onto the bus of the combination-listed control unit results in a catastrophic failure of the control unit.

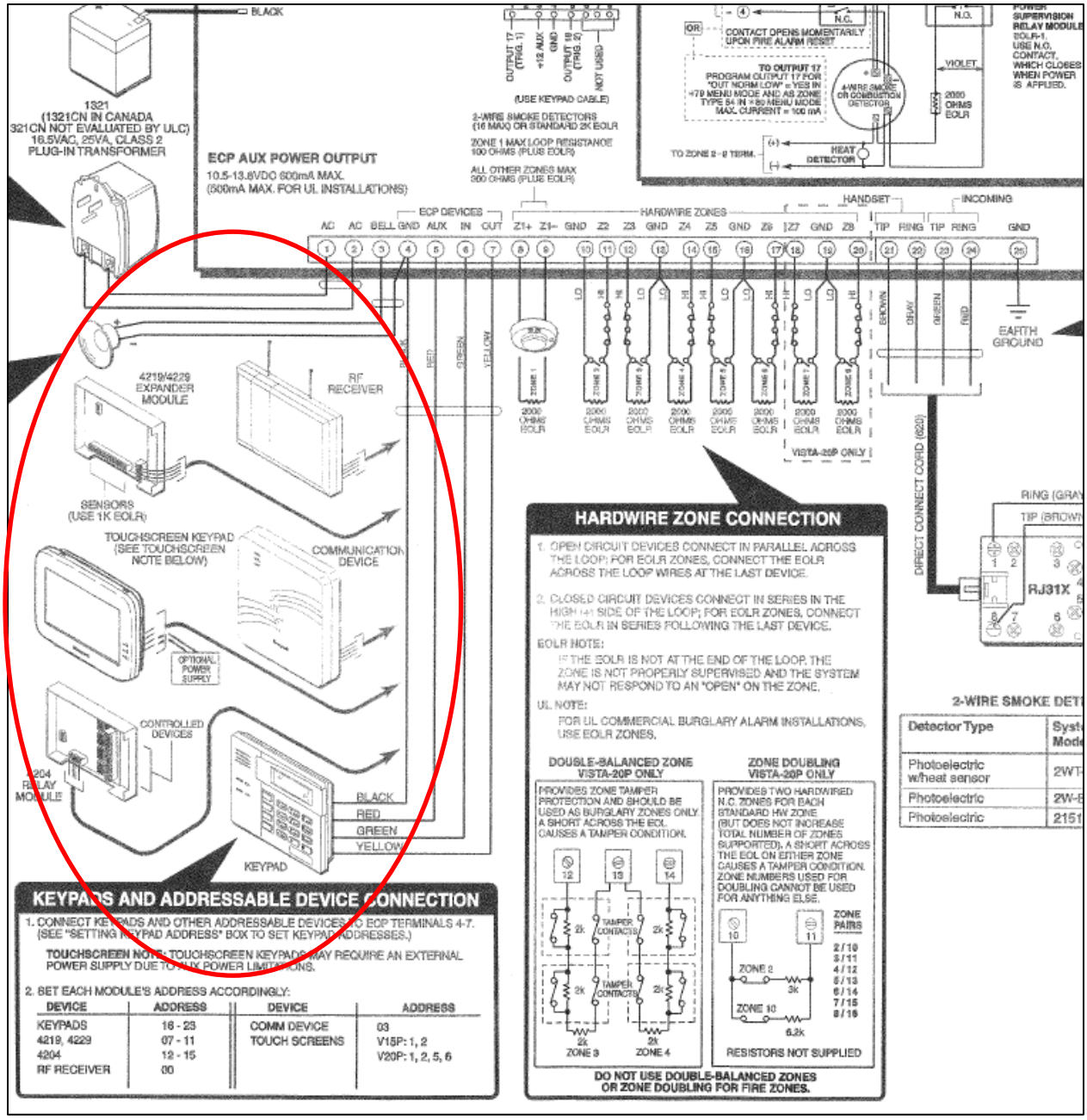

Figure 1. Honeywell Vista 20P Quick Installation Guide. Red annotation added by CSE indicating devices intended to be attached to the data-bus wiring.

As discussed above, Mr. Zwirn has opined that the disabling of the single data-bus of the control unit by a short circuit condition introduced in one of the pieces of connected equipment on its common wiring and/or in the data-bus wiring itself, manifests itself into a catastrophic failure of the control unit. Therefore, the installed equipment is no longer able to function as it is listed

and required to perform. In turn, this will cause the control unit to fail to audibly notify occupants of a fire emergency in their home or business, as well as it will fail to successfully transmit alarm signal(s) to a remote monitoring/central station for fire department notification and dispatch. Mr. Zwirn of IDS contacted Combustion Science & Engineering, Inc. (CSE) and contracted with CSE to serve as an independent entity to scientifically evaluate this potential mode of failure and the applicable codes and standards, in order to independently test and validate or refute Mr. Zwirn's hypothesis regarding this mode of failure. This project has been designed and engineered to test the hypothesis put forth by Mr. Zwirn, that said mode of failure exists and whether or not said mode of failure violates Underwriters Laboratories, Inc. (UL) and National Fire Protection Association (NFPA) standards.

ANALYSIS

In order to meet the objectives of the project, CSE reviewed the applicable codes and standards to determine what is required regarding combination-listed fire and burglar alarm control units and conducted its own independent research and testing of this equipment to scientifically and technically validate or refute whether the mode of failure exists. Mr. Zwirn has indicated that said mode of failure exists for many combination-listed commercial burglar and fire alarm control units and for all combination-listed household burglar and fire alarm control units that utilize a single data-bus for its fire and burglar alarm control units. Therefore, CSE evaluated this hypothesis as it relates to combination-listed household and commercial fire and burglar alarm system control units. CSE approached the problem utilizing the Scientific Method, as explained in NFPA 921, the Guide for Fire and Explosion Investigations (2021). CSE considered the available information on the problem, gathered additional data, formed hypotheses, and tested the hypotheses. The testing of the hypotheses included an analysis of the applicable codes and standards as well experimental testing by CSE.

Review of Applicable Standards

Before testing of the equipment, CSE first considered the requirements in the applicable codes and standards related to this issue. National Fire Protection Association (NFPA) Standard 72®, National Fire Alarm and Signaling Code®, is recognized as the most authoritative standard for fire alarm systems nationwide. It is adopted by reference in most, if not all, model building codes and some version of NFPA 72® is adopted in some manner in every state in the nation (NFPA Codefinder, 2022). NFPA 72® has separate requirements for protected premises (commercial) installations in Chapter 23 as well as household (residential) installations in Chapter 29. As Mr. Zwirn has indicated that he thinks this mode of failure exists for some commercial combination-listed control units and most, if not all, household combination-listed control units, CSE analyzed the language in both portions of the standard. The relevant language from the applicable standards, including all relatively recent versions of said standards, can be found in Appendix C.

The language in NFPA 72® has been previously examined by Mr. Zwirn, particularly for household combination-listed fire and burglar alarm control units. Mr. Zwirn's expert report provides opinions about combination-listed control units being non-conforming and in some of his online videos[2] it says that the mode of failure which he found violates NFPA 72® and applicable UL standards as it relates to this equipment. Additionally, Mr. Merton Bunker, PE, the current Chair of the Correlating Committee of NFPA 72®, has also written two letters (see Appendix E) where he has opined that Mr. Zwirn's hypothesized fault violates the language of NFPA 72® and applicable UL standards for household and commercial installations. A letter from Mr. Zygmunt Staszewski, PE, FSFPE, an engineer with decades of fire alarm design experience, also indicates that the hypothesized fault violates the language of NFPA 72® and applicable UL standards.

For commercial installations, NFPA 72® (2019 Edition) states the following for listed non-fire alarm equipment connected to combination listed control units as follows:

> **23.8.4.4.2** *If the equipment is attached to the fire alarm system via separate pathways, then short circuits or open circuits in this equipment, or between this equipment and the fire alarm system*

[2] https://www.youtube.com/channel/UC_AhSpzDIMXP0EgCtMGWnZQ?

> *pathways, shall,[3] not impede or impair the monitoring for integrity of the fire alarm system or prevent alarm, supervisory, or fire safety control signal transmissions.*

This language appears in all editions of NFPA 72® between 2010 and 2022. In NFPA 72® versions from 2007 and before, the language was slightly different:

> **6.8.4.3** *Short circuits, open circuits, or grounds in this equipment or between this equipment and the fire alarm system wiring shall not interfere with the monitoring for integrity of the fire alarm system or prevent alarm, supervisory, or fire safety control signal transmissions.*
>
> **6.8.4.4** *All non-fire alarm components of a combination system shall be listed for fire alarm use unless removal, replacement, failure, or maintenance procedure on any non-fire alarm hardware, software, or circuits does not impair the required operation of the fire alarm system.*

Notably, this language or similar goes back to the 1993 Edition of NFPA 72® and is even referenced to being modified from the 1990 edition. Accordingly, the requirement that faults between the equipment and the system shall not impede or prevent monitoring of the system or control signal transmissions of the fire alarm system has been part of the standard for over three decades, if not longer.

The older versions of the standard state that if a fault were to occur in non-fire equipment, it shall not affect the operation and performance of the fire alarm equipment. In the newer versions, it is only if the non-fire equipment is on a separate pathway. For this analysis, CSE is assuming that the data-bus wiring contains both security and fire devices at all times and, therefore, the security devices are not on a separate pathway from the fire devices. But if only security devices were attached to the data-bus wiring, this would be a separate pathway and cannot interfere with the fire alarm functions. If Mr. Zwirn is correct that said potential mode of failure exists, it would violate the older versions of NFPA 72®. Additionally, if Mr. Zwirn is correct that said potential

[3] The word "Shall" indicates a mandatory requirement under NFPA 72®.

mode of failure exists, whereby non-fire equipment is attached to the system including burglar alarm devices and/or other non-fire equipment on the pathway without fire alarm equipment (data-bus wiring) and that short circuit conditions on this equipment or its wiring can completely disable the ability of a fire alarm system to perform alarm, trouble and supervisory functions, this would violate the current requirements of NFPA 72® for combination-listed commercial burglar and fire alarm systems.

The language for household installations is even more definitive on the issue. Since the 1999 edition, for household installations, NFPA 72®, National Fire Alarm Code®, has required that:

> **29.10.7.5** *Faults in other systems or components shall not affect the operation of the fire alarm system.*

Additionally, since 1993 (and referenced back to at least the 1989 edition of NFPA 74 in the 1993 text), except for the 1999 edition, NFPA 72® has required the following, or very similar, for household systems:

> **29.10.7.6** *Where common wiring is employed for a combination system, the equipment for other than the fire and carbon monoxide alarm system shall be connected to the common wiring of the system so that short circuits, open circuits, grounds, or any fault in this equipment or interconnection between this equipment and the fire and carbon monoxide alarm system wiring does not interfere with the supervision of the fire and carbon monoxide alarm system or prevent alarm or trouble signal operation.*

Significantly, NFPA 72® is noticeably clear-cut for household systems stating that if non-fire equipment is attached to a fire alarm system (i.e., a combination listed system), faults in this equipment shall not impede the operation of the fire alarm system. The residential non-fire alarm equipment does not have to be on a separate circuit for this mode of failure to be a violation of the fire code as is required in newer versions of NFPA 72® for commercial applications. Again, CSE is assuming that the data-bus wiring contains both fire and security devices. The reason for these

requirements is that fire alarm equipment is held to different listing standards due to the criticality of life safety to occupants in a household occupancy.

Indeed, the intention here is to ensure that if any of the equipment is not listed for fire alarm system use, and does not serve a fire alarm function, and is ultimately connected to a combination-listed control unit, it shall not render the system non-functional as it relates to a short circuit condition being introduced onto the single data-bus of the control units common wiring. If Mr. Zwirn's hypothesized mode of failure exists in household combination-listed fire and burglar alarm control units, we are of the opinion that this behavior of the system would materially violate these sections of NFPA 72®. Accordingly, our conclusion is in alignment with that of Mr. Bunker, PE and Mr. Staszewski, PE. This conclusion is also in agreement with responses from NFPA staff regarding technical questions posed by Mr. Zwirn, particularly regarding combination-listed household system requirements in NFPA 72®. A Senior Electrical Engineer of the NFPA staff in his response to Mr. Zwirn has replied that "You are correct that a failure in another system connected to the fire alarm system cannot affect the function of the fire alarm system."[4] In summary, if the non-fire equipment is attached via a common wiring data-bus which would also include fire equipment, it cannot interfere with the functionality and reliability of the fire alarm system.

NFPA 72® is recognized as the most authoritative national standard for fire alarm systems and while NFPA standards outline some requirements for the performance of fire and combination-listed alarm equipment, the actual implementation and testing of those requirements in equipment is conducted by Nationally Recognized Testing Laboratories (NRTLs). Some examples of these laboratories are Factory Mutual, Intertek, and Underwriters Laboratories, Inc. (UL). These NRTLs evaluate and test equipment and if found acceptable, they "list" the equipment in accordance with applicable UL Standards. NFPA 72® requires that only equipment that is listed for its intended use be installed. NFPA 70®, National Electrical Code®, likewise requires listed equipment. The requirement for the use of only listed equipment ensures that there is an independent entity responsible for compliance (the NRTL). While there are multiple NRTLs as it relates to fire and

[4] NFPA Technical Question response by Christopher Coache, Senior Electrical Engineer, dated 9/21/2021.

security alarm equipment, the applicable standards for implementation of the performance and reliability characteristics are subsumed within UL standards. Other NRTLs, such as Intertek, test the equipment in compliance with these same UL standards before listing the equipment. By way of further explanation, the NRTL is required to test or otherwise confirm that the equipment meets each section of the applicable UL standards. If the equipment performs in accordance with each applicable section of the standard, the equipment can achieve listing. If not, the equipment cannot be listed and is considered non-conforming. In turn, and as a result, the equipment cannot be put into the stream of commerce.

For combination-listed systems, UL standards include many requirements for components, materials, and testing to ensure that the equipment is safe for use and ultimately meets the crucial life safety reliability requirements and NFPA 72®. For commercial combination-listed systems, the applicable standards are:

- UL 864 Control Units and Accessories for Fire Alarm Systems
- UL 365 Police Station Connected Burglar Alarm Units and Systems

For household combination-listed systems, the applicable standards are:

- UL 985 Household Fire Warning System Units
- UL 1023 Household Burglar-Alarm System Units

All of the applicable UL standard requirements over multiple versions of these standards can be found in the code and standard matrices included as Appendix C.

As it relates to commercial systems, UL 365 states that all equipment for combination systems needs to also meet UL 864. This is for the 4th and 5th editions dating back to at least 1997 and to the present. As it relates to UL 864 for fire alarm system control units and accessories, starting in 2008, the 9th edition required the following:

> **56.1** *When a fire alarm system shares components, equipment, circuitry, and installation wiring with non-fire systems, short circuits, open circuits, or grounds in the non-fire system equipment or the connections between the non-fire system equipment and the fire alarm products shall*[5] *not impair the required operation of the fire alarm system or prevent appropriate alarm, supervisory, or*

[5] The word "Shall" indicates a mandatory requirement.

> *trouble annunciation and signaling, or unfaulted fire-safety control activation.*
>
> **56.2** *To determine compliance with 56.1, the operation, removal, replacement, failure, or maintenance procedure on any hardware, software, or circuit not performing any of the fire alarm system functions shall not cause loss of any of the fire alarm functions, including supervision, or prevent required alarm, supervisory, trouble, or fire-safety annunciation, signaling, or actuation.*

As the hypothesized mode of failure includes a shutdown of the system including failure of indicating and/or notification devices, dialers, and keypads to function, as a result of the introduction of a short circuit condition onto the data-bus wiring or components that are required to be connected to the single data-bus, this violates UL 864. In 2014, with the 10th edition of UL 864, the requirements changed to some degree, but the conclusion is the same:

> **61.1.7** *Short circuits or open circuits in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall not impede or impair the monitoring for integrity of the fire alarm system as described in Common Performance and Monitoring for integrity – Protected-Premises Units/Systems Section 56, nor impede or impair any fire alarm signal transmission or operations.*
>
> **61.1.8** *Single ground faults in the non-fire alarm equipment shall not impede or impair the monitoring for integrity of the fire alarm system, or impede or impair any fire alarm, supervisory or trouble signal transmissions or operation.*
>
> **61.1.9** *The required operation of the fire alarm equipment shall not be impaired by any failure of the non-fire alarm equipment hardware, software or circuits, or by any maintenance procedure, including removal or replacement of defective equipment or powering down of the non-fire equipment.*

As can be seen, in the more recent edition of UL 864, the requirements are expanded to better explain what is expected, but the ultimate meaning is still clear, that any non-fire components or wiring between those components and the fire alarm system shall not affect the operation of the fire alarm system. Unlike in newer versions of NFPA 72®, it does not specify separate pathways as noted for commercial applications. Therefore, if Mr. Zwirn's hypothesis holds for commercial

combination-listed control units, the non-conformity would violate UL 864, and by reference, UL 365.

For household combination-listed fire/burglar alarm system control units, UL 1023 is similar to UL 365 for commercial panels. Since 1999, UL 1023 has required household combination-listed systems to also meet the requirements of UL 985. Unlike UL 365, though, an additional requirement is present in UL 1023 and has been within this standard since 1996 it states:

> **1.3** *These requirements also apply to the use of combination systems, such as a combination fire-burglar-alarm system control unit. A combination system is connected in such a manner that fault conditions (shorts, open, grounds) in the burglar-alarm system circuit wiring, or interconnection between the fire- and burglar-alarm system circuits, will not interfere with the supervision of the fire alarm system or will not prevent intended alarm signal operation.*

Therefore, based on this language, if the hypothesized mode of failure exists, this would violate UL 1023 directly.

Further, UL 985 has had the following language in it since at least 2000 to present day:

> **1.4** *These requirements also apply to the use of combination systems, such as a combination fire-burglar alarm system control unit, which uses circuit wiring common to both systems. When common wiring is used for combination systems, it shall be connected in such a manner that internal fault conditions (shorts, opens, grounds) in the nonfire alarm (burglary) system circuit wiring, or faults between the fire and nonfire alarm system circuits, will not interfere with the supervision of the fire alarm system or prevent intended alarm signal transmission.*

Additionally, from 2000 to 2015, the following summarizes the requirements in the 5th Edition of UL 985:

> **41.4** *An open or ground fault in any circuit extending from a household control unit, other than the initiating device circuit, shall not affect the operation of the control unit except for the loss of the function extending from that circuit.*

> **41.6** *A fault condition, open, ground, or short of other than a fire alarm circuit of a combination control unit shall not affect the fire-alarm signaling.*

Section 41.4 of UL-985 has continued into the 6th edition of the standard to present day. However, section 41.6 is no longer in the standard as of the 6th edition in 2015, but other newer requirements have been included as follows:

> **41.3.1.3** *Short circuit or open circuit single faults in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall not impede or impair the monitoring for integrity of the fire alarm system, nor impede or impair any fire alarm signal transmissions or operations.*
>
> **41.3.1.6** *The required operation of the fire alarm equipment shall not be impaired by any failure of the non-fire alarm equipment hardware, software or circuits, or by any maintenance procedure, including removal or replacement of defective equipment or powering down of the non-fire equipment.*

Review of all of these requirements indicates that UL 985 directly and by reference in UL 1023, as well as directly in UL 1023, unilaterally requires that household combination-listed systems include provisions that if there is some type of short circuit failure in the non-fire equipment or wiring to that equipment, it shall not affect the ability of the fire-portion of the alarm system to continue to operate reliably. If the hypothesized failure is correct, and a short circuit condition in the non-fire equipment and/or its interconnected data-bus wiring attached to the data-bus can render a household combination-listed system completely non-functional, this would be a violation of UL 1023 and UL 985, at the very least for systems listed since 2000, if not earlier.

Our findings agree with the analysis of Mr. Bunker, PE and Mr. Staszewski, PE, that the hypothesized fault identified by Mr. Zwirn violates UL 1023 and UL 985. NFPA 72® and the appropriate UL standards indicate that faults in non-fire equipment shall not cause the fire alarm system control unit to completely shut down as Mr. Zwirn has hypothesized and as he has successfully demonstrated in a multitude of online video tests. Mr. Zwirn sent his expert report outlining his findings to UL in the fall of 2020 and received a short letter response from UL in late

2020. The response from UL focuses mostly on household combination-listed systems. In the letter (see Appendix D), UL makes a number of claims regarding their interpretations of NFPA 72® and UL 985, the applicable UL standard for a household fire alarm system, and how said interpretation is implemented. These responses will each be addressed separately herein. Regarding the interpretation of NFPA 72® and UL 985, UL makes the statements shown in Figure 2.

- Both Chapter 29 of NFPA 72, the National Fire Alarm and Signaling Code, and UL 985 stipulate that a wire to wire (short circuit) fault is to be applied only where non-fire alarm equipment is directly interconnected to the fire alarm system.
    - UL 985, 6th edition published 2015 (Nov 2019 effective date) states:
      Section 41.3.1.3 *Short circuit or open circuit single faults in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall not impede or impair the monitoring for integrity of the fire alarm system, nor impede or impair any fire alarm signal transmissions or operations.*
- Circuits interconnecting only fire alarm equipment are not required by UL 985 to be subjected to a short circuit fault. This includes your example of an attack by fire, specifically resulting in a short circuit fault on the data/power bus. Neither NFPA 72, Chapter 29, nor UL 985 include requirements with respect to household fire alarm system pathway survivability to attack by fire.

Figure 2. Portion of UL response letter dated 12/18/2020 regarding NFPA 72®/UL 985 interpretation.

In their interpretation, UL is stating that NFPA 72® and UL 985 stipulate that a shorting fault is only to be applied when the non-fire alarm equipment is "directly interconnected" to the fire alarm system. This interpretation by UL is inconsistent with the language that UL has incorporated in their response letter (section 41.3.1.3 of UL 985) to Mr. Zwirn and does not exist in the language of NFPA 72® and UL 985 standards. Stated differently, there is no such stipulation in either of these standards and UL remains silent in their response as to the source of this language, and moreover, the verbiage stipulated does not reside within the applicable UL and NFPA standards. In contrast, the applicable UL standard only uses the term "common wiring" as discussed previously (section 1.4 of UL 985).

UL goes on to actually include the language from the 6th edition of UL 985 in Section 41.3.1.3 specifically stating that a short in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall not impede its operation. Notably, there is no

use of wording such as "directly interconnected" between the non-fire equipment and the fire alarm system, and while UL 985 has changed between the 5th and 6th editions as discussed previously, Section 1.4 of both versions of UL 985 still mandates and states that when common wiring is used for combination systems, a short shall not interfere with the fire alarm system supervision nor alarm signal transmission.

Furthermore, devices, including non-fire equipment, are connected in parallel through the data-bus using common wiring. If a fault or short circuit occurs on the data-bus, this should not impede the functionality of the system. Yet Mr. Zwirn claims this failure mode exists. In CSE's opinion, UL's claims in their response letter on how the connection can be implemented (i.e. "directly interconnected) are incorrect on this critical point, and it is highly unusual for any NRTL to attempt to re-interpret the plain language of the standards.

The second main bullet point in Figure 2 states that circuits with only fire alarm equipment are not required to be subjected to a short circuit fault. Notwithstanding this statement by UL, it is not germane to CSE's analysis since the hypothesized mode of failure is not in the fire alarm equipment or circuits with only fire alarm equipment. It is in the common wiring of the data-bus, and any of its required parallel connected non-fire alarm equipment, such as control modules, zone expansion modules, wireless radio receivers, wireless radio alarm transmitters, DC powered security equipment, etc. For fire equipment, if a two-wire smoke detector initiating device circuit were to have a short and fail, it is expected that said circuit may fail but the rest of the control unit would remain active as said two-wire smoke detector circuits do not connect to the data-bus. If a four-wire addressable smoke detector were solely connected to the data-bus, and under the proposed mode of failure had a short, this would also cause failure of the data-bus and failure of the control unit. Because this failure is in only fire equipment, though, this is not in violation of NFPA 72® or UL 985. UL's statement is in agreement with our understanding of the standard language. Nevertheless, CSE is considering a situation where there will be both fire and non-fire devices attached to the data-bus wiring. Additionally, perhaps it should be considered in future editions of UL 985 whether a fire device attached to data-bus wiring should be allowed to not only fail itself when subjected to a short circuit fault, but also to catastrophically fail the entire control unit. Again, it may be difficult to do anything about the fire-only equipment, which has to be present for fire functionality. The currently standard-mandated extra protection against shorts and

other faults is only for non-fire equipment and common wiring, as the equipment is not necessary for fire alarm system functionality and therefore shall not affect it. Regardless, if the single data-bus and its common wiring have one or multiple non-fire components attached, which is commonplace, it shall be subjected to a short circuit fault testing protocol, as per UL and NFPA standards before it can successfully pass the listing process by the NRTL. Non-fire components shall not affect the operation of the fire alarm system, the supervision of the fire alarm system, or any fire alarm signals being transmitted to the remote central station. In other words, the applicable UL standards and NFPA standards as discussed in this report mandate this uninterrupted method of functionality, operation and reliability despite a short circuit condition being introduced onto the common wiring of the control unit data-bus and/or as it relates to a short circuit condition being introduced onto the non-fire equipment that is required to be connected in parallel to the single data-bus of the control unit.

The UL response letter goes on to specifically indicate how UL applies section 41.3.1.3 from the 6th edition of UL 985, as shown in Figure 3.

- Products/devices may additionally include security listing in addition to fire alarm listing when both fire and security signals can be processed by the product. An example includes zone expanders. These products connected directly to the communication/power bus are considered fire alarm products, even where only separate security devices are interconnected to them. In this instance the combination fire and security product/device is functioning as an isolation device. The device is isolating non-fire alarm listed devices from the communication/power bus. This alleviates the need to conduct a short circuit test on the communication/power bus.
- When non-fire alarm devices are directly connected to fire alarm listed devices/products, which are in turn connected to the communication bus, short circuit faults are applied directly to the non-fire alarm devices and the interconnecting wiring to the fire alarm listed devices/products. Compliance is confirmed when the short circuit faults do not affect fire alarm and/or carbon monoxide alarm signaling operation.
- A short circuit fault is applied to the communication/power bus when non-fire alarm devices (for example when a system incorporates a Listed security only keypad or addressable PIR) are directly connected to the communication/power bus.
- A short circuit fault is also applied to output power supply circuits when non-fire alarm equipment is directly connected to those circuits. Typically, this includes security devices such as passive infrared motion sensors.

Figure 3. Portion of UL response letter dated 12/18/2020 regarding how UL applies Section 41.3.1.3 of the 6th edition of UL 985.

From Figure 3, it can be seen that UL attempts to rationalize and justify to Mr. Zwirn that when a product is listed for both fire and security, such as the example of a zone expansion module, if it is connected directly to the communication/power bus (data-bus), it is considered a fire product. This interpretation is improper. For any alarm product to only be considered as a fire product requires its listing to match the listing statement that UL makes. However, zone expansion modules are dual listed for both fire and burglary applications so it cannot only be considered as a fire product since the equipment manufacturer sought and received the dual burglar and fire alarm listing from the NRTL. If other non-fire items are connected to that dual-listed product, "the product is acting as an isolation device" statement by UL is incorrect as shown in the video testing by Mr. Zwirn and verified in CSE's independent scientific testing, as will be discussed later in this report. Therefore, the suggestion by UL that the data-bus or the wiring between the data-bus and the zone expansion module is "interconnecting wiring" does not reside in the applicable UL and NFPA standards. It is common wiring.

Similarly, the suggestion by UL that it does not need to test for shorts because it is isolated is incorrect, based upon the dual listing of the component part and the fact that the zone expansion modules are not isolation devices when they are connected to the data-bus nor can UL create verbiage such as "directly interconnected" in an attempt to modify the plain language in the UL standard. Otherwise, there would be no requirements or rationale to have sections 1.4, 41.6, 41.3.1.6 and 41.3.1.7 of UL 985 and the applicable sections of NFPA 72® in force. Further, there is nothing in any of the sections of both the UL standards and NFPA 72® standard that define a zone expansion module as an isolation device. Moreover, there is nothing codified in the equipment manufacturers specifications for any of the alarm equipment manufacturers of zone expansion modules that define a zone expansion module as an isolation device.

At the same time, the respective on-board input circuits on zone expansion modules are inherently supervised with factory supplied end of line resistors (EOLR). Mr. Zwirn has shown in video testing that with a zone expander, while the expander is indeed isolating burglar-only circuits from the data-bus, they are still being powered and the burglar-only circuits must be connected to the data-bus through the zone expander. This means that the common wiring connecting the non-fire devices to the fire alarm system includes not only the wiring from the non-fire equipment to the zone expander, but also the common wiring from the zone expander to the data-bus. UL should

be testing the unsupervised side of the zone expander. The result of this is that if there is a short circuit fault condition on the common wiring from the data-bus to the zone expander, which is all part of the common wiring to the non-fire devices, it catastrophically shuts down the entire panel. It should also be emphasized that in none of the equipment manufacturers specifications reviewed as part of CSE's analysis, includes any of the language of what UL attempts to suggest by number one (1) changing the plain language of applicable UL standards and number (2) by positing that they do not apply to the data-bus. It just equates to inaccurate claims by UL regarding the actual language in the standard.

UL's suggestion in its letter to Mr. Zwirn as to how UL is implementing this listing requirement is inaccurate. The straight-forward technical rationale is that this implementation does not recognize a short circuit condition being introduced on the common wiring between the fire alarm system and non-fire alarm devices. In the simplest of terms, not adhering to the plain language in the listing requirements materially violates section 41.3.1.3 and it also violates section 1.4 of UL 985.

As further evidence of the violations of 41.3.1.3, UL is indicating that if a non-fire device is connected to a fire device, which is then connected to the data-bus, they apply a short to the non-fire alarm device and the wiring between it and the fire alarm device. They also indicate in their letter, though, that they apply a short circuit fault to the actual data-bus when non-fire alarm devices are directly connected to it, and they apply a short circuit fault to output power supply circuits where non-fire alarm equipment is connected to those circuits. This would seem to cover some of the scenarios identified by Mr. Zwirn where some devices are getting power from the same terminals as the data-bus and would cover some devices connected to the data-bus.

Notwithstanding, despite how UL represents in its letter as to how they specifically test listed equipment, Mr. Zwirn has shown in his many videos of testing that short circuits on this wiring still renders the combination-listed fire and burglar alarm control unit non-functional. Given that, from a fire protection standpoint, CSE does not technically see anyway to duplicate what UL states that it does based upon CSE's testing (as discussed later in this report) and Mr. Zwirn's many videos, nor did UL offer any explanation or videos to support its contention. It was considered that perhaps UL was testing to older versions of UL 985. To the extent the UL letter to Mr. Zwirn was based upon the combination-listed equipment not being tested to the 5th edition

of UL 985, but instead to the (6th edition) of UL 985, this hypothesis also fails, as UL does not exclude the 5th or 6th edition in their response letter to Mr. Zwirn and the 5th edition of UL 985 still uniformly requires that a short circuit condition in the common wiring shall not affect the operation of the fire alarm system. Accordingly, if Mr. Zwirn's testing is accurate and his proposed failure mode exists, it seems more likely than not that technically this testing could not have been performed by UL as stated, nor could it have successfully been performed on any of the different combination-listed control units that Mr. Zwirn tested, which failed, or on the combination-listed control units that CSE tested, which also failed as described later in this report.

What UL represents that it performs and how its testing occurs is not consistent with the technical results and physical evidence of the scientific and technical testing that was independently performed by CSE, and shown in Mr. Zwirn's testing videos. To the extent that UL was testing the combination-listed control units as represented and required by the respective listings, their testing should be able to be duplicated. CSE found that the combination-listed control units still fail following what UL represented to Mr. Zwirn as their testing methodology. In any event, CSE repeatedly found that combination-listed control units become non-functional when introducing a short circuit condition onto the data-bus.

As will be discussed later in this report, CSE demonstrated that testing in accordance with UL and NFPA standards will cause combination-listed control units to instantly fail. Noticeably absent in UL's letter to Mr. Zwirn is that despite UL receiving videos of testing on many different types of combination-listed control units from Mr. Zwirn, UL chose not to demonstrate that what they say occurs, nor do they make any attempt to explain or reconcile why Mr. Zwirn's videos, time after time, demonstrate that combination-listed control units from different manufacturers repeatedly failed. Of course, if UL now wanted to perform testing, CSE would consider participating in, analyzing, or attending this testing at the UL laboratory, or to host said testing.

As identified by Mr. Zwirn and equipment manufacturers, combination-listed control units require common data-bus wiring to be installed throughout a household or commercial occupancy (generally for thousands of feet) in both concealed and unconcealed spaces. For instance, a zone expansion module can be located and connected to the data-bus circuit anywhere in an occupancy, and this applies to connection of both non-fire and security initiating detection devices. Mr. Zwirn, Merton Bunker, Zygmunt Staszewski, and now CSE have jointly taken the position that UL has

violated Section 1.4 of UL 985, besides the other provisions of UL and NFPA 72® standards that are codified in this report. Additionally, UL has certainly violated the spirit and intention of these requirements which is to ensure that smoke and carbon monoxide detectors that are installed in an occupancy are functional and reliable for the life safety function that they were designed and manufactured to provide to both consumers and the public. A short on this wiring, per Mr. Zwirn's hypothesis, shall not render the system non-functional. Consequently, the proposed mode of failure violates Section 1.4 of UL 985 and would certainly violate the spirit and intention of these requirements, which is to ensure that a non-essential non-fire portion of a combination-listed system is not capable of rendering the fire alarm portion of the system non-functional if a short circuit condition occurs.

UL also indicates that NFPA 72® and UL 864 do not have identical requirements for commercial applications as compared to household requirements. While it is true that the language is slightly different in UL 864, as well as in the non-household chapters of NFPA 72®, and hence is not identical, the meaning of these requirements is completely identical in that a short circuit condition in non-fire alarm equipment, wiring, etc. shall not render the fire alarm portions of a combination-listed system non-functional. The NFPA 72® requirements for commercial systems make mention of separate circuits, but the UL 864 standard does not. Therefore, if any combination-listed commercial system also suffers from the hypothesized mode of failure, they too would be non-conforming to NFPA 72® and UL 864 standards.

One last point that UL makes in its letter to Mr. Zwirn, after the bulletpoints discussed above (see Appendix D), is that they have not received information of field incidents associated with these products. First, there is nothing in UL standards which states that before a requirement is subsumed in any of its standards, UL must first have evidence of a field incident(s). Secondly, UL is implying that this issue is not manifesting itself as a real danger to life safety in the field**.** Noticeably, if UL has not received any information of field incidents, then it begs the question as to why then both UL and NFPA 72® have had this language in the aforementioned standards for decades that short circuit conditions shall not affect the operation of the fire alarm system. The salient issue here is that these minimum requirements were incorporated into both UL and NFPA 72® standards time after time, and adopted by members of the respective technical committees and panels, so it is not germane whether UL is or is not aware of any field incidents, because the

applicable language subsumed in both UL and NFPA 72® standards constitutes mandatory requirements, that if not complied with violate both of the respective standards. Non-conforming combination-listed control units increase the dangers to all occupants in an occupancy who rely on early warning life safety fire alarm systems to escape from a premises before it becomes untenable. If the mode of failure is confirmed, then Mr. Zwirn has identified that there are household and commercial burglary and fire alarm combination-listed control units that are non-conforming.

By way of technical comparison, if a non-conformity was identified in a smoke detector(s), it would require immediate replacement wherever they were installed. Under this same scenario, if these combination-listed control units are non-conforming, the same process would even be more significant because all automatic fire alarm initiating detection devices (smoke detectors) in an occupancy are required to either connect wirelessly or through hardwiring to the combination-listed control unit for system functionality and operation

CSE could certainly envision scenarios where foreseeable failure would be expected on a combination-listed control unit. For instance, during a fire in a wall cavity (or attic, or basement) near data-bus wiring or equipment that is connected to the data-bus, whereby the fire compromises the data-bus or equipment that is connected to the data-bus and causes a sustained short circuit condition to be introduced onto the control unit. With the combination-listed control units being non-functional, no sirens would sound inside the home (unless the system was armed with hardwired DC-powered burglar devices as will be described later), none of the remote system keypads would sound, and the remote central station would not receive any fire alarm signal(s). Dangerously, this can rapidly happen before smoke from the fire can escape from inside the wall cavity and travel into the living space where automatic initiating detection devices are required to be present to detect fire and smoke. Indeed, NFPA reports that electrical distribution and lighting equipment is the third most prevalent cause of home structure fires, constituting 9% of all residential home fires (Ahrens and Maheshwari, 2021). Additionally, they lead to 18% of residential deaths and 10% of residential injuries. Therefore, electrical fires are a real threat in residences and certainly can and do occur in wall cavities. Furthermore, while only 26% of fires occur in the home, 75% of fire deaths and 72% of fire injuries occur in the home (Ahrens and Maheshwari, 2021). Additionally, NFPA has indicated that 60% of residential fire deaths occur when smoke detection is not present or disabled (Ahrens, 2021). This indicates the magnitude of

the home fire problem and the critical role that functional smoke detection plays in residential life safety. If a fire were to occur in a wall cavity and disable the detection and notification system, this would be a dangerous situation that has been shown in these studies to lead to residential fatalities and injuries.

Regardless, if the proposed failure mode exists, this indicates that there are combination-listed fire and burglar alarm systems present in the field that do not meet the minimum requirements of the applicable UL and NFPA standards. Further, the reason(s) for listing equipment is to ensure that it meets the applicable and minimum NFPA and UL standards. The requirements for these applicable NFPA and UL standards are made by technical committees or standards technical panels consisting of a mix of industry professionals, subject matter experts and stakeholders who determined that such requirements were necessary and required. If said requirements are not being met by equipment manufacturers as hypothesized, but are still being listed and installed, this non-conformity is extremely dangerous from a life-safety standpoint. Authorities Having Jurisdiction (AHJs) would likely not accept the installation of non-conforming equipment that contains fire alarm and carbon monoxide automatic initiating detection devices. Alarm contractors and users of the equipment would likely not knowingly accept the installation of non-conforming equipment for any alarm system let alone for a life safety fire alarm and carbon monoxide system with the inherent dangers hypothesized by Mr. Zwirn.

In sum, CSE's review of the codes and standards indicates that these documents clearly indicate that an electrical short circuit on non-fire equipment, including the data-bus and its wiring, shall not render a combination-listed fire/security system control unit non-functional. This code requirement applies for both household and commercial combination-listed systems and dates back to at least the early 2000s. UL's implementation and interpretation of these sections of their standards and NFPA 72® have allowed this hypothesized and dangerous mode of failure to exist, despite their testing and ergo, combination-listed control units have become listed despite non-conformities. Failure of combination-listed control units to meet UL and NFPA standards violates the adopted fire code in each state of the United States and needlessly puts occupants inside an occupancy at an increased risk of serious personal injury and/or death during a life safety emergency.

Experiments

CSE was contracted by IDS Research and Development, Inc. to perform independent scientific and technical testing of combination-listed alarm control units based upon the hypothesized mode of failure. CSE, acting as an independent fire protection engineering laboratory, endeavored to test and evaluate Mr. Zwirn's hypothesis, with both a combination-listed household fire and burglar alarm control unit and a combination-listed commercial fire and burglar alarm control unit.

The combination-listed commercial alarm control unit selected for testing was a Honeywell Vista 32FBPT. The household combination-listed alarm control unit selected was a Honeywell Vista 20P. Both of these panels are designed to be installed with fire and security alarm components, and both are UL listed. The 32FBPT panel is listed under UL 985, 1023, 365, 864, and 1610. The Vista 20P control unit is listed under UL 985, 1023, 365, and 1610.

New Vista 32FBPT and 20P combination-listed alarm control units were purchased from ADI Distribution[6] by IDS Research and Development, Inc. but were shipped, new and unopened, directly from ADI to CSE. CSE then contracted with AFA Protective Systems, Inc.[7] (Halethorpe, Maryland office) to install and program both of the systems. AFA is an internationally recognized alarm systems contractor who had its certified technicians install all of the alarm equipment at CSE's laboratories in accordance with the equipment manufacturers' published specifications, UL Standards and NFPA 72® standards. The only information that was explained to AFA, the contractor/installer, is that CSE will be performing testing on the systems after installation and that the equipment shall be installed in the same manner as how a standard commercial or household fire and security systems installation would be. The two combination-listed control units were installed as two separate alarm systems with fire and security equipment connected to each panel.

All connected alarm equipment was UL listed and typical of a standard fire and security system installation. The equipment parts that were integral to each of the installed alarm systems are listed below.

[6] More information can be found at www.adiglobal.com.
[7] More information can be found at www.afap.com.

Honeywell Vista 32FBPT System Components:

- One hardwired 4-wire smoke detector (BK-4WB)
- One wireless smoke detector (5808W3)
- One hardwired motion detector (CK-IS3035V)
- One hardwired audio glass break detector (CK-FG1625)
- One fire keypad (6160CR-2)
- One security keypad (6160)
- One wireless radio receiving unit (5881ENHC)
- One horn/strobe audible indicating appliance for fire alarm annunciation (BK-P2RL)
- One siren for security alarm annunciation (WAVE2)
- One hardwired door contact
- One wireless radio alarm transmitter (SLE-LTEVI)
- One V-plex expander (UZ-NP712)
- One Enhanced Control Protocol (ECP) isolator (ECP-ISO)

Honeywell Vista 20P System Components:

- One hardwired 4-wire smoke detector (BK-4WB)
- One wireless smoke detector (5808W3)
- One hardwired motion detector (CK-IS3035V)
- One hardwired audio glass break detector (CK-FG1625)
- One security keypad (6160)
- One wireless radio receiving unit (5881ENH)
- One siren for security alarm annunciation (WAVE2)
- One hardwired door contact
- One wireless radio alarm transmitter (LTEM-XV)
- One relay module (4204)

It should be noted that the only piece of equipment that was installed by CSE (and not AFA) was the Model 4204 relay module. The installation of this relay module was done after AFA completed its work. Adding the relay module to the Vista 20P combination-listed control unit allowed the power to be reset to the 4-wire smoke detector after it went into an alarm condition using the relay module, rather than the trigger cable, once the remote system keypad was manually reset.

All other equipment, installation, wiring, and programming was completed and initially functionally tested by AFA. As part of the scope of work, AFA trained CSE on the testing and functionality for both of the Honeywell Vista combination-listed control units. AFA also provided CSE with remote access to their own UL Listed Central Station that was monitoring both of the

accounts so that alarm, trouble and restore activity/history could be viewed during testing by CSE in real-time using AFA's specialized monitoring website that is directly linked to AFA's UL Listed Central Station.

Both systems were mounted to a single sheet of plywood. Terminal blocks were added to the wiring inlet of each piece of attached equipment in order to facilitate the short circuit testing. Once the installations were completed, the two systems were tested and documented with photographs as well as a diagram of the wiring configurations. Photos of the two completed systems as well as final wiring terminations inside the panels are shown as Figure 4 through Figure 8 below.

Figure 4. Vista 20P (left) and Vista 32FBPT (right) combination-listed control units mounted to a sheet of plywood in CSE's laboratories.

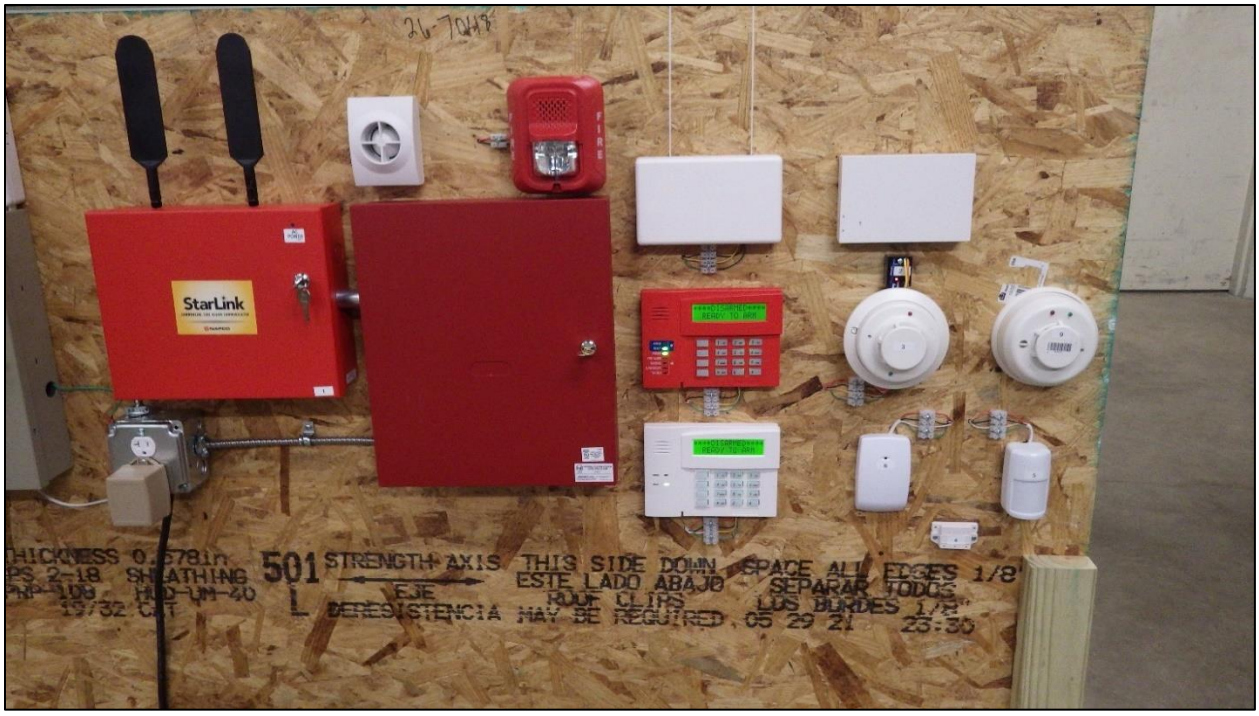

Figure 5. The Vista 32FBPT combination-listed control unit and all other fire/security devices connected to it.

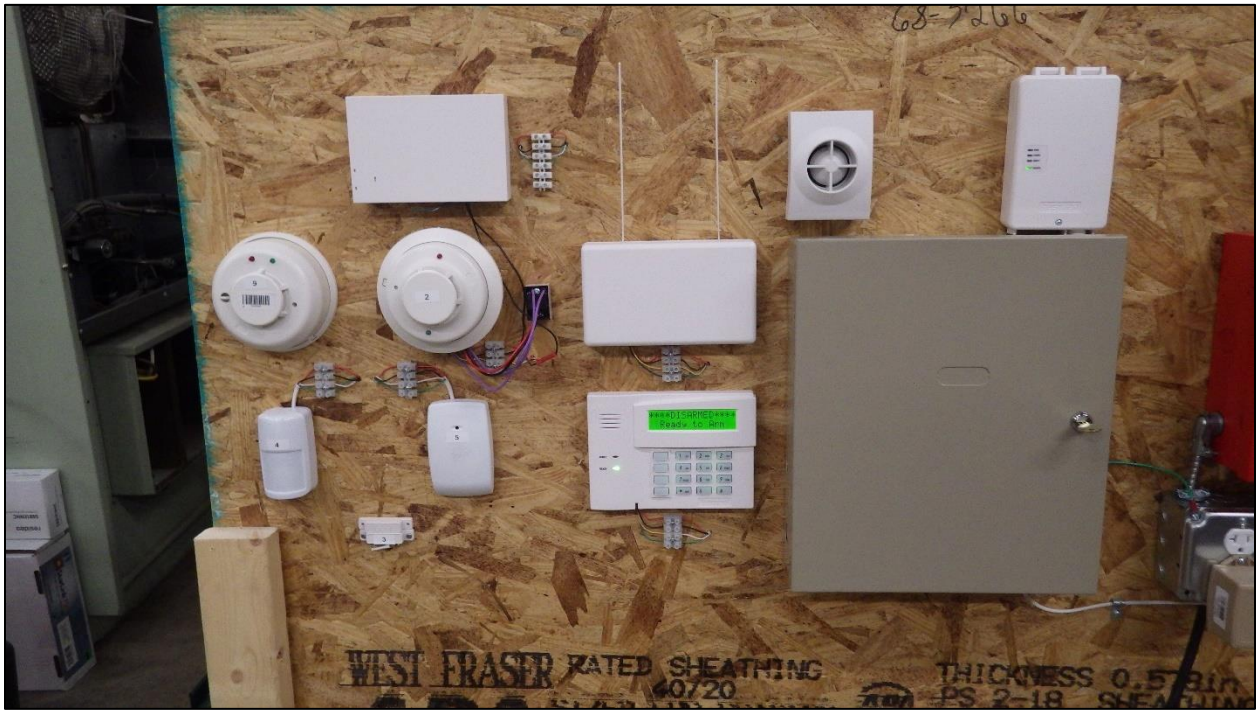

Figure 6. The Vista 20P combination-listed control unit and all other fire/security devices connected to it.

Figure 7. Inside of the Vista 32FBPT control unit panel showing wiring configuration and final wiring terminations.

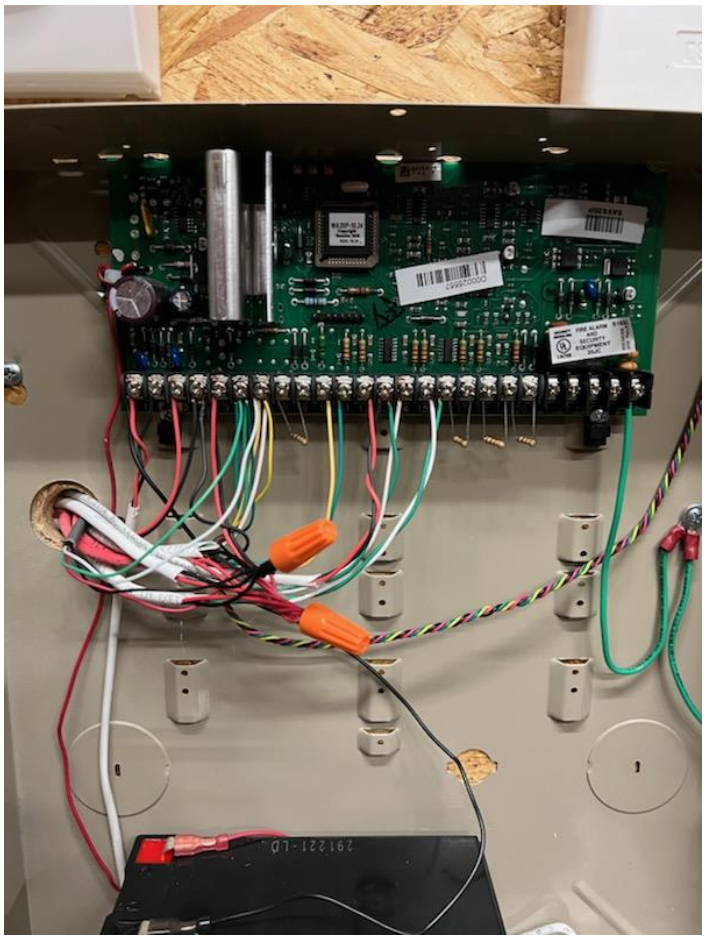

Figure 8. Inside of the Vista 20P control unit panel showing wiring configuration and final wiring terminations.

The first test completed on the two systems was alarm functionality testing when the system was in a normal condition. The purpose of this test was to confirm that the alarms activated properly and that the central station received the alarm signal(s), as would be expected for a properly operating fire and security alarm system. The system was not armed for the smoke detector/alarm tests. Conversely the system was armed for the motion and glass break detector testing. The smoke detectors were triggered using their on-board test buttons. The testing procedure for this was as follows:

1. Activate individual alarm sensor zones (smoke detectors were triggered using their on-board test buttons, motion detectors were triggered by creating detectable movement in

front of this intrusion detection device, and the audio glass break detectors were activated by simulating the sound of breaking glass through tapping on the outside of the detector).

2. Allow the initiating detection device to stay in an alarm condition for approximately 1 minute, and then silence and reset the alarm system from one of the remote station keypads.
3. Record central station activity/history.

A table was completed for all alarm functionality testing. The results from this testing can be seen in Table 1.

Device	Time of Test	Device Alarm Locally?	Panel Received Alarm and Siren Sounded?	Central Station Signal History
Vista 32FBPT				
Motion detector	3:15 PM	Yes	Yes	Z5 Burglary Alarm Motion – 15:15:57 Z5 Motion Restore – 15:16:01
Glass Break detector	3:17 PM	Yes	Yes	Z6 Burglar Alarm Glassbreak – 15:18:58 Z6 Glassbreak Restore – 15:19:00
4-wire smoke detector	3:21 PM	Yes	Yes	Z3 Smoke Detector Alarm – 15:21:27 Z3 Restore Fire Alarm – 15:23:04
Wireless smoke detector	3:24 PM	Yes	Yes	Z9 Wireless Smoke Alarm – 15:24:28 Z9 Wireless Smoke Restore – 15:25:28
Vista 20P				
Motion detector	3:00 PM	Yes	Yes	Z4 Burglar Alarm Motion – 15:00:26 Z4 Motion Restore – 15:00:49
Glass Break detector	3:04 PM	Yes	Yes	Z5 Burglar Alarm Glassbreak – 15:04:24 Z5 Glassbreak Restore – 15:04:53
4-wire smoke detector	3:08 PM	Yes	Yes	Z2 Smoke Detector Alarm – 15:07:52 Z2 Smoke Detector Restore – 15:08:51
Wireless smoke detector	3:11 PM	Yes	Yes	Z9 Wireless Smoke Alarm – 15:10:51 Z9 Wireless Smoke Restore – 15:11:56

Table 1. Alarm functionality testing results for both combination-listed control units in the normal condition.

As mentioned previously, the smoke detectors were activated using their respective on-board test buttons. The smoke detectors also responded to UL Listed canned smoke as well. For all alarm functionality tests on both systems, each device alarmed locally, activated the system

keypad(s) built in annunciators, and the siren sounded. Additionally, an alarm for the zone assigned to the individual initiating detection device that was activated transmitted an alarm signal via the respective systems' wireless radio alarm transmitters to the central station, followed by a restore when the systems keypad was reset. An example of the central station activity/history log for the Zone 9 wireless smoke detector that was connected to the Vista 20P combination-listed household fire and burglar alarm control unit during the alarm functionality testing as shown in Figure 9 below.

Event Date	Operator	Zone	State	Event	Location/Comment
3/28/2022 15:11:56		9	R	CIR110 - RESTORE Fire Alarm	*Test WIRELESS SMOKE
3/28/2022 15:10:51		9	A	1506 - SMOKE DETECTOR-COMM	*Test WIRELESS SMOKE

Figure 9. Central station activity/history log for the Vista 20P Combination-listed Control Unit that was programmed on the control unit to wirelessly monitor and supervise the wireless smoke detector which was functionally activated into an alarm condition.

This alarm functionality testing confirms that the alarm systems were programmed and installed correctly, have communication with the central station, and would react normally in the case of a fire or security device activation. The second test completed on the two combination-listed alarm system control units was electrical short circuit testing. The purpose of this testing was to directly assess Mr. Zwirn's hypothesis. The data-bus wiring is a bundle of wiring consisting of 4 individual conductors. Two of the wires are designated for positive and negative power, and the other two wires are designated for the data transfer. Each piece of individual equipment was electrically shorted by connecting the positive and negative wires going into each device (2 of the data-bus wires). Short circuit tests were completed for a momentary short (a few seconds) and a sustained short. During a fire, the heat melting the individual data-bus wires together will create a short circuit condition that will persist indefinitely. Therefore, the sustained short testing is recreating what would happen with fire attacking the data-bus wiring.

Both systems were not armed during this initial testing. However, these short circuit tests were repeated with the systems armed as well. The procedure for the electrical short circuit testing on both systems was as follows:

1. Short individual device across power input for a few seconds and then remove the short.
2. Record what equipment lost power during the short.
3. Record the time that it took for the system to restore and view the central station activity/history.
4. After momentary short was removed and system is back to normal operating condition, short same individual device for a sustained amount of time (greater than 60 seconds) and record system behavior.

The results of the electrical short circuit testing on the Vista 32FBPT panel system can be seen in Table 2.

Vista 32FBPT Electrical Short Circuit Condition Testing					
Device Shorted	**Time Momentary Short Circuit Condition Created**	**What Equipment Lost Power**	**Time to System Restore/Keypad Reading**	**Central Station History**	**Results for Sustained Short Circuit Condition**
4-Wire Smoke Detector	5:00	4-wire alarm, wireless receiver, Burglary keypad, GB/Motion detectors, and wireless radio alarm transmitter	Power to devices returns in seconds, 01 Radio Trouble on fire keypad can be cleared immediately once short circuit condition is removed	Z1 Radio Trouble – 17:02:13 Z1 Radio Restore – 17:02:18 Z2 Smoke Power Trouble – 17:02:20 Z2 Smoke Power Restore – 17:02:25	Sustained short circuit condition rendered combination listed control unit non-functional and non-compliant with UL and NFPA standards
Motion Detector	4:52	Motion and glass break detector	Faults for GB and motion detectors on burglary keypad during short return to normal once short circuit condition is removed, DC power to detectors returns in seconds	None	None
Glass Break Detector	4:53	Motion and glass break detector	Faults for GB and motion detectors on burglary keypad during short return to normal once short circuit condition is removed, DC power to detectors returns in seconds	None	None
Wireless Receiver	5:05	4-wire alarm, wireless receiver, Burglary keypad, GB/Motion detectors, and wireless radio alarm transmitter	Power to devices returns in seconds, 01 Radio Trouble on fire keypad can be cleared immediately once short is removed	Z1 Radio Trouble – 17:07:10 Z1 Radio Restore – 17:07:15 Z2 Smoke Power Trouble – 17:07:17 Z2 Smoke Power Restore – 17:07:21	Sustained short circuit condition rendered combination listed control unit non-functional and non-compliant with UL and NFPA standards
Fire Keypad	4:54	Only fire keypad	Fire keypad powers back on in a couple of seconds	None	None
Burglary Keypad	4:56	Only burglary keypad	Burglary keypad powers back on in a couple of seconds	None	None
V-plex Zone Expander	4:58	Only expander	Expander powers back on in a couple of seconds	None	None

Table 2. Vista 32FBPT electrical short circuit condition results.

For the commercial Vista 32FBPT combination-listed control unit, when a short circuit condition was created across the power wiring (2 of the 4 wires in the data-bus circuit wiring) to

the 4-wire smoke detector or wireless receiver, power and functionality was lost to all other devices connected to the data-bus. This included the 4-wire smoke detector, wireless receiver, motion and glass break detectors, remote system burglary keypad, and the wireless radio alarm transmitter. The only devices that remained functional during the introduction of a short circuit condition to the 4-wire smoke detector or to the wireless receiver were the fire keypad and V-plex expander. The reason the wireless receiver on the system lost power and functionality when a short circuit condition was introduced onto the data-bus circuit is that it is required to connect to the same positive and negative DC power output terminals in the control unit that the positive and negative power side of the data-bus circuit is required to connect to as well. The fire keypad showed a radio trouble and sounded its audible on-board annunciator during the short circuit condition, but the fire radio was without power and became non-functional. Therefore, no data was transmitted to the central station. In other words, under these short circuit conditions to either the 4-wire smoke detector or wireless receiver, no fire alarm signals or any other signals would be able to be transmitted to the central station during a fire emergency. For example, if a fire melted the wiring running from the data-bus to either of these devices and caused a short, the devices would remain permanently in a short circuit condition meaning that the wireless radio would remain without power and no alarms could be transmitted to the central station.

Generating a momentary short circuit of a few seconds across the 4-wire detector or wireless receiver and then removing it caused all of the data-bus connected devices to lose power and then power back up within a few seconds. Once the short was removed and power had been restored to all devices, the radio trouble on the fire keypad could be cleared. The central station received a radio trouble/restore and a sensor trouble/restore, but only once the short circuit was removed. Thereafter, the radio was powered back on and was able to reconnect for normal functionality.

Creating a short circuit condition across the fire keypad, burglary keypad, or the V-plex zone expander only caused that individual device being shorted to lose power. When the short circuit condition was removed, the shorted device powered back on within a few seconds, and no signals were transmitted to the central station as a result of the short.

A short circuit condition that was introduced across the power input of the glass break detector caused the motion detector to lose functionality as well. The inverse of this was also true,

in that a short circuit condition across the motion detector caused the glass break detector to lose functionality. As set forth in the equipment manufacturers specifications, the auxiliary power output for DC powered intrusion detection devices uses one common supply. When either of the security alarm initiating detection devices (glass break and motion detector) were shorted, faults appeared on the security keypad for both the glass break and motion detector. The two security alarm initiating detection devices shorted each other out, but did not short out any other pieces of equipment so no troubles or alarms were received at the central station and the faults cleared once the short circuit conditions were removed and power was restored.

The difference in outcomes when the various pieces of equipment were shorted is due to the presence of the ECP isolator. Notably, the ECP isolator is not included with the purchase of the Vista 32FBPT combination-listed control unit but was used and installed in CSE's testing. Items on the protected side of the isolator (burglary keypad, security alarms) were isolated from the fire devices (4-wire smoke detector). Therefore, a short on the protected side of the isolator did not short the rest of the devices wired to the data-bus. In contrast, a short on the unprotected side of the isolator in either the 4-wire smoke detector or wireless receiver caused all other devices on the data-bus to lose power and functionality, including the wireless radio.

The behavior of the Vista 32FBPT system was largely the same if the short was created for a longer period of time (i.e., sustained) and then removed. The only change with a longer sustained shorted condition on the control unit which was then removed involved the 4-wire smoke detector and wireless receiver. If a short circuit condition across either of these two devices was left for a longer period of time or if it was sustained indefinitely, as would be expected to occur if fire attacking this wiring created the short circuit condition, the radio would be non-functional for the entire duration of the short circuit condition. After about a minute of the radio and other equipment connected to the data-bus being non-functional, a "Check 974 Dialer 1" appeared on the fire keypad. Upon removal of the longer duration short, the system was still able to power back on normally. Once power was restored to the radio and the rest of the devices, the "Check 974 Dialer 1" eventually restored itself and the system returned to being fully functional.

The 32FBPT system performed largely the same for the short circuit testing when both the fire and security keypads were set to armed away and armed stay. A short circuit across the 4-wire smoke detector or wireless receiver still caused all other devices connected in parallel to lose

power, including the fire radio. The only difference in this case was that the burglary siren sounded when these hardwired motion detectors and/or glass break detectors were shorted. The activation of the alarm system indicating that the burglar alarm was activated does not warn the occupant of a fire and/or carbon monoxide detection emergency as the siren sounds as a burglar alarm, not as a T-3 fire or T-4 carbon monoxide siren. This siren continued to sound until the short was removed and the alarm could be cleared on the burglary keypad. While the short was in place, the wireless radio did not have power and could not transmit any troubles or alarms. Conversely, wireless security devices or other hardwired security devices not powered by the DC power from the control unit will not be affected or activate the system if armed because they do not require DC power from the control unit to maintain their closed circuit (non-alarm) status.

While armed, a short circuit across either of the glass break or motion detector also caused the burglary siren to sound. Unlike when the system was not armed and the burglary keypad showed a fault on these alarms during the short, the burglary keypad showed an alarm for both the glass break and motion detectors during a short circuit to the burglary alarm devices while the system was armed. The security siren continued to sound until the alarms were cleared on the burglary keypad.

When the 32 FBPT was armed, a short to the fire keypad, burglary keypad, and V-Plex zone expander did not cause any sirens or short out any other devices, which are the same results as when the system was not armed.

For the household system, the results of the electrical short circuit testing on the Vista 20P combination-listed control unit indicate that it failed to comply with both UL and NFPA standards. The results of the short circuit testing on the Vista 20P can be seen in Table 3 below.

Vista 20P Electrical Short Circuit Testing					
Device Shorted	**Time Momentary Short Circuit Created**	**What Equipment Lost Power**	**Time to System Restore/Keypad Reading**	**Central Station History**	**Results for Sustained Short Circuit Condition**
4-Wire Smoke Detector	3:54	All listed in table, plus communicator	2 seconds for power restore to system, then keypad showed Fire Trouble 02, radio reconnected after 110 seconds	Z2 Fire Trouble – 15:55:39 Z803E33 Expander Module Reset – 15:55:45 Z2 Restore Fire Trouble – 15:56:18	Sustained short circuit condition rendered combination listed control unit non-functional and non-compliant with UL and NFPA standards
Motion Detector	3:58	All listed in table, plus communicator	2 seconds for power restore to system, then keypad showed Fire Trouble 02, radio reconnected after 110 seconds	None	Sustained short circuit condition rendered combination listed control unit non-functional and non-compliant with UL and NFPA standards
Glass Break Detector	4:03	All listed in table, plus communicator	2 seconds for power restore to system, then keypad showed Fire Trouble 02, radio reconnected after 110 seconds	None	Sustained short circuit condition rendered combination listed control unit non-functional and non-compliant with UL and NFPA standards
Receiver	4:07	All listed in table, plus communicator	2 seconds for power restore to system, then keypad showed Fire Trouble 02, radio reconnected after 110 seconds	None	Sustained short circuit condition rendered combination listed control unit non-functional and non-compliant with UL and NFPA standards
Keypad	4:14	All listed in table, plus communicator	2 seconds for power restore to system, then keypad showed Fire Trouble 02, radio reconnected after 110 seconds	Z2 Fire Trouble – 16:08:39 Z803E33 Expander Module Reset – 16:08:47 Z2 Restore Fire Trouble – 16:09:15	Sustained short circuit condition rendered combination listed control unit non-functional and non-compliant with UL and NFPA standards
Relay	4:11	All listed in table, plus communicator	2 seconds for power restore to system, then keypad showed Fire Trouble 02, radio reconnected after 110 seconds	None	Sustained short circuit condition rendered combination listed control unit non-functional and non-compliant with UL and NFPA standards

Table 3. Vista 20P electrical short circuit condition results.

For the Vista 20P combination-listed household control unit, a short circuit condition introduced across the power leads of any of this equipment instantly rendered the system non-functional. This finding is logical because, by design, the auxiliary power output final wiring terminations reside on the same positive and negative terminals that the single data-bus of the control unit reside on. Therefore, since all of the power and data-bus connected devices are required to be connected in parallel with each other, the introduction of a short circuit condition on any piece of equipment shut-downs every other piece of equipment that is part of the common wiring of the single data-bus. A short circuit condition applied to any fire or security device caused all equipment connected to the data-bus to lose power. This included the keypad, 4-wire smoke detector, wireless receiver, zone expansion module and radio alarm communicator. The wireless radio alarm transmitter did not have power for as long as the short circuit condition remained in place, meaning no alarms could be transmitted to the central station in the case of a fire emergency or any other alarm condition.

Introducing a sustained short and then removing the short circuit condition on the Vista 20P panel's data-bus demonstrated non-conformity to the applicable UL and NFPA 72® standards. While for a temporary short of 5 seconds or less the system was able to power back up normally, if the short circuit across any of the devices was sustained for longer than 10 seconds and then removed, power was not restored correctly to all of the shorted devices that were connected to the data-bus. Upon removal of the prolonged short, the keypad was able to power back on but then immediately proceeded to begin beeping and displaying "Check 100RF Receiver," "Check 103 Radio," and "Check 112 Relay Module." Upon further inspection, it was found that the output voltage from the data-bus to all connected devices was reduced by over half, from 13 volts to 5.25 volts. The low voltage condition is the cause of the checks on the keypad, and ergo the system still remains completely non-functional even when the short circuit is removed. None of the initiating detection devices were able to activate into an alarm condition at this voltage, and the radio remained non-functional. This means that even if a short circuit condition is momentary to one of these devices and then the short circuit condition is removed, the system remains non-operational if the short circuit on the data-bus lasted for more than just 10 seconds.

The only way to restore the system and get the output voltage to return to the correct value after this prolonged short circuit condition was to reset the system by unplugging the AC power and disconnecting the backup battery. Once this procedure occurred, the system returned to normal functionality and output voltage after the reset, but this voltage drop occurred every time any of the devices powered from the data-bus were shorted for longer than 10 seconds.

In contrast, for a temporary short of 5 seconds or less, the system was able to power back up within a couple of seconds once the short circuit condition was removed. Upon power being restored, there was a fire trouble on the keypad that could be cleared. The radio took approximately 110 seconds to reconnect to the central station. Once reconnected, the central station received a fire trouble/restore and a module reset for some of the short circuit tests. Whether a fire trouble/restore was received at the central station following power being restored, appeared to be based upon on how long the fire trouble displayed on the systems keypad before it was cleared. If the fire trouble was cleared immediately, the trouble/restore was never received at the central station upon the radio communicator reconnecting. If the fire trouble remained on the keypad for a short period of time before being cleared it did allow the trouble/restore to be received at the central station, but only once the short was removed and power was returned to the communicator.

It should be noted that there would never be a case where a short circuit condition created by fire melting wiring connected to the data-bus would not remain in a sustained condition. For all short circuit testing completed, if the wireless radio alarm transmitter lost power due to a short circuit on the data-bus, it remained without power and non-functioning until the short was removed and/or power was reset to the entire system. By design, the auxiliary power output final wiring terminations reside on the same positive and negative terminals that the single data-bus of the control unit reside on. Therefore, since all of the power and data-bus connected devices are required to be connected in parallel with each other, the introduction of a short circuit condition on any piece of equipment shut-downs every other piece of equipment that is part of the common wiring of the single data-bus.

Performing the short circuit testing for the Vista 20P with the system armed away and armed stay instead of non-armed yielded similar results to the non-armed tests. A short circuit across any device caused all other data-bus connected devices to lose power, including the wireless radio. The only difference for the 20P system when armed was that a short circuit to any device

caused the single siren for the system to sound with a burglary (non-T-3) alarm tone. In the case of a temporary short circuit of less than 5 seconds, the system restored back to full power, with an alarm for the glass break and motion detector zones showing on the keypad once the keypad restored. Once power was returned, the alarms on the keypad would be cleared and the siren would stop sounding.

For a sustained short circuit of longer than 10 seconds to any device on the 20P when armed, the system was not able to restore to full power once the short was removed. This behavior is the same as when the system was non-armed, except that the siren continued to sound from the time of the short circuit until power could be reset to the entire system by unplugging the panel and disconnecting the battery. In this case of a sustained short that is restored, the keypad is completely non-functional and there is no way to clear the burglar alarms.

The siren sounds during a short circuit condition when the system is armed because an alarm is triggered for the burglary detection devices at their corresponding hard-wired zones on the data-bus when power is lost to either of the motion or glass break detectors. If these detectors were wireless devices connected to a wireless receiver, the short circuit condition would not trigger an alarm and the siren would not sound in the case of a short circuit to any of the data-bus connected devices. If the short circuit condition is created by a fire when the system is armed, for instance a fire in a wall attacking the data-bus wiring, the siren will sound with a burglary alarm pattern instead of the T-3 fire pattern, giving no indication of a potential fire. Additionally, the wireless radio would not have power and no alarms could be transmitted to the central station. This behavior is not in conformance with the applicable UL and NFPA standards. In the case of this short circuit condition being sustained while the system is armed and the siren sounds, there is no way to stop the siren from sounding other than disconnecting all power from the system. This is also a dangerous condition as the entire system would now be unpowered and disabled.

The Vista 20P combination-listed system is non-functional during a short circuit to any connected fire and security devices due to all data-bus connected devices losing power during the short, including the wireless radio. This is true for when the system is both armed and non-armed, with the only difference being that the single siren for the system sounds while this short circuit is in place when the system was armed at the time of the short.

Upon completion of the testing, both systems remain connected as they were for the testing and are still installed on the plywood, just unpowered. The systems will remain in such a state for one year from the date of this report in case there is any need for further testing and/or inspection of the configuration setup. CSE will also contemplate any possible videotaped testing, similar to that performed by Mr. Zwirn, that visually demonstrate the results described herein. Finally, the central station history for all testing was saved via screenshots and is available upon request.

Discussion

As has been demonstrated in CSE's analysis and the experiments conducted, there is both scientific certainty and validity to Mr. Zwirn's hypothesized mode of failure for combination-listed single data-bus fire and burglar alarm control units, and they do not conform to UL and NFPA standards. Given that, from a Fire Protection Engineering perspective, this equipment is non-conforming, and it is dangerous to all persons who rely on it for mission critical functional and reliable life safety.

Regarding the commercial combination-listed system (Vista 32FBPT), it mostly performed as would be expected pursuant to UL and NFPA standards, yet for a control unit to "mostly" perform does not coincide with the requirements set forth in UL and NFPA standards. The verbiage "mostly performed" is applied due to the inclusion of the separately sold ECP isolator providing isolation on some devices from others. Nevertheless, a sustained short circuit introduced onto the wireless receiver caused the entire system to fail catastrophically which is considered a material violation of both UL and NFPA standards. Likewise, a sustained short circuit condition being introduced onto the power side of a hardwired 4-wire smoke detector also caused the entire system to fail catastrophically.

While the commercial system performed better than the household system, as will be described later in this section, there were still some issues with the performance of the commercial system that were concerning at best, and non-code-conforming at worst. Regarding the non-code conformance, this relates to a sustained short circuit condition being applied to the systems wireless receiver. In the setup utilized by CSE, the only device attached to the wireless receiver was a wireless smoke detector. However, CSE's assumption is that the overall majority of combination-listed control units that are installed and/or are going to be installed will more likely

than not always have both security and fire alarm components that are connected to the control unit. It is important to recall that NFPA 72® and UL 864 state the following for commercial systems respectively:

> **23.8.4.4.2** *If the equipment is attached to the fire alarm system via separate pathways, then short circuits or open circuits in this equipment, or between this equipment and the fire alarm system pathways, shall not impede or impair the monitoring for integrity of the fire alarm system or prevent alarm, supervisory, or fire safety control signal transmissions.*
>
> **56.1** *When a fire alarm system shares components, equipment, circuitry, and installation wiring with non-fire systems, short circuits, open circuits, or grounds in the non-fire system equipment or the connections between the non-fire system equipment and the fire alarm products shall not impair the required operation of the fire alarm system or prevent appropriate alarm, supervisory, or trouble annunciation and signaling, or unfaulted fire-safety control activation.*

If both fire and security wireless transmitters are configured to the wireless receiver, and a short circuit introduced onto the data-bus wiring causes the wireless receiver to instantly fail, this would violate 56.1 of UL 864. It would not violate NFPA 72® 23.8.4.4.2 as it is not attached via a separate pathway. But if *only* security devices were attached to the wireless receiver, a configuration that is allowed, this would violate 23.8.4.4.2 of NFPA 72® as it would now be a separate pathway and would still violate 56.1 of UL 864. Therefore, this is not code-conforming. As discussed previously, CSE can envision many scenarios where a fire could originate in a concealed wall space, in an attic or basement and compromise the common-wiring to the combination-listed control units' data-bus and/or its wiring by a short circuit condition being introduced onto the data-bus. In this scenario, this would render the entire system non-functional.

As a final point regarding the commercial system, it appears that the reason most of the system stayed functional during the introduction of a short circuit condition onto the data-bus was because of the presence of the ECP isolator. Despite this, the ECP isolator is apparently not a part of the basic Vista 32FBPT system when it is purchased. It is required to be ordered and installed separately. Additionally, the ECP isolator does not work on the Vista 20P residential system. As

a side note, the AFA installer technician indicated that he had never installed an ECP isolator previously and it was not his standard practice to do so. The use of an ECP isolator[8] is necessary for the Vista 32FBPT combination-listed commercial fire and burglar alarm system to ensure some level of code compliance (though not complete compliance) for fire and security devices and protection from shorts as is required in accordance with UL and NFPA 72® standards. Accordingly, it must be included with the purchase of the combination-listed control unit and the instruction manuals and training materials should stress the importance of its use so that the system performs in accordance with its listing.

Regarding the household system (Vista 20P), CSE confirmed that a short circuit on any particular piece of equipment on the single data-bus's common wiring or fire or security equipment that is required to be connected to the data-bus wiring in parallel created a situation where the system instantly became non-functional. In this condition, the system has no ability for the siren(s) attached to the combination-listed control unit to audibly sound unless the system is armed and burglar devices are hardwired to control unit, where the siren still only sounds in a burglar (non-fire) tone. Additionally, none of the remote system keypads annunciated and the combination-listed control unit had no ability to transmit alarm signal(s) to the central station. This violates NPFA 72® as well as UL 985 and UL 1023. Faults, such as electrical short circuits, shall not interfere with the operability of the fire functions of the system. Yet, in Mr. Zwirn's videos, and confirmed in CSE's testing, an electrical short circuit does exactly that.

If the short is brief, the system is able to return to full functionality once the short clears. But if the short persists, even just more than 10 seconds, which would not be uncommon, it not only rendered the system non-functional, but the system remained non-functional even when the electrical short was cleared, and the only way to restore functionality to the system was to fully restart it by removing and reconnecting all power. This is particularly concerning, because consumers are not going to reset the system by unplugging it and disconnecting the battery, nor are they going to ever know that fire has attacked the data-bus. It should be noted that fire attacking the data-bus and/or its connected equipment and/or the data-bus wiring will create a sustained short

[8] The ECP isolator is manufactured by Honeywell but is sold separately and will not work with the household Vista 20P combination listed control unit.

circuit condition because the insultation protecting the wiring will heat up and melt, causing the conductors to melt together.

After confirmation by CSE of the hypothesized failure in a combination-listed household fire and burglar alarm system with this independent testing, one must return to the UL letter where they explained and justified how they test household combination-listed systems for short circuits. This was shown previously as Figure 2 and Figure 3 and is included again below as Figure 10. The letter can also be seen in full in Appendix D. Numbering has been added in Figure 10 to facilitate discussion about several specific bullet points. Additionally, each bullet point is copied below and is subsequently addressed.

- Both Chapter 29 of NFPA 72, the National Fire Alarm and Signaling Code, and UL 985 stipulate that a wire to wire (short circuit) fault is to be applied only where non-fire alarm equipment is directly interconnected to the fire alarm system.

1

  - UL 985, 6th edition published 2015 (Nov 2019 effective date) states:
    Section 41.3.1.3 *Short circuit or open circuit single faults in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall not impede or impair the monitoring for integrity of the fire alarm system, nor impede or impair any fire alarm signal transmissions or operations.*

- Circuits interconnecting only fire alarm equipment are not required by UL 985 to be subjected to a short circuit fault. This includes your example of an attack by fire, specifically resulting in a short circuit fault on the data/power bus. Neither NFPA 72, Chapter 29, nor UL 985 include requirements with respect to household fire alarm system pathway survivability to attack by fire.

2

- Products/devices may additionally include security listing in addition to fire alarm listing when both fire and security signals can be processed by the product. An example includes zone expanders. These products connected directly to the communication/power bus are considered fire alarm products, even where only separate security devices are interconnected to them. In this instance the combination fire and security product/device is functioning as an isolation device. The device is isolating non-fire alarm listed devices from the communication/power bus. This alleviates the need to conduct a short circuit test on the communication/power bus.

3

- When non-fire alarm devices are directly connected to fire alarm listed devices/products, which are in turn connected to the communication bus, short circuit faults are applied directly to the non-fire alarm

4

devices and the interconnecting wiring to the fire alarm listed devices/products. Compliance is confirmed when the short circuit faults do not affect fire alarm and/or carbon monoxide alarm signaling operation.

- A short circuit fault is applied to the communication/power bus when non-fire alarm devices (for example

5

when a system incorporates a Listed security only keypad or addressable PIR) are directly connected to the communication/power bus.

- A short circuit fault is also applied to output power supply circuits when non-fire alarm equipment is

6

directly connected to those circuits. Typically, this includes security devices such as passive infrared motion sensors.

Figure 10. Portion of UL response letter dated 12/18/2020 regarding how UL indicates they apply Section 41.3.1.3 of the 6th edition of UL 985 (combination of previous Figure 2 and Figure 3).

- Both Chapter 29 of NFPA 72, the National Fire Alarm and Signaling Code, and UL 985 stipulate that a wire to wire (short circuit) fault is to be applied only where non-fire alarm equipment is directly interconnected to the fire alarm system.

1 ○ UL 985, 6th edition published 2015 (Nov 2019 effective date) states:
Section 41.3.1.3 *Short circuit or open circuit single faults in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall not impede or impair the monitoring for integrity of the fire alarm system, nor impede or impair any fire alarm signal transmissions or operations.*

In bullet point 1, UL concedes that a short in non-fire equipment shall not impair the fire functionality, though they then try to qualify their statement by mentioning that if only "directly interconnected" to the fire alarm system. As discussed previously, notably, this qualifier by UL is not included in the language of the UL standards. However, UL decided to change its standard language in response to Mr. Zwirn's verified claims where it specifically states "common wiring", and "directly interconnected" is not included in the plain language of UL standards. Accordingly, UL's statements are erroneous. Nevertheless, CSE's testing indicates that a short on non-fire equipment of a household combination-listed system impedes the fire alarm system's operations and hence violates both UL and NFPA standards.

- Circuits interconnecting only fire alarm equipment are not required by UL 985 to be subjected to a short circuit fault. This includes your example of an attack by fire, specifically resulting in a short circuit fault on the data/power bus. Neither NFPA 72, Chapter 29, nor UL 985 include requirements with respect to household fire alarm system pathway survivability to attack by fire.

2

As a UL STP member, you are aware that you can submit a proposal to the appropriate UL STP(s) for their consideration to add such a requirement.

In bullet point 2, the statement by UL, that circuits interconnecting only fire alarm equipment are not required by UL 985 to be subjected to a short circuit fault, is not what the hypothesized failure mode was based upon. The next part of this bullet point states "This includes your example of an attack by fire, specifically resulting in a short circuit fault on the data/power bus." Neither NFPA 72®, Chapter 29, nor UL 985 include requirements with respect to household fire alarm system pathway survivability to attack by fire. This does not address Mr. Zwirn's now verified mode of failure.

3 • Products/devices may additionally include security listing in addition to fire alarm listing when both fire and security signals can be processed by the product. An example includes zone expanders. These products connected directly to the communication/power bus are considered fire alarm products, even where only separate security devices are interconnected to them. In this instance the combination fire and security product/device is functioning as an isolation device. The device is isolating non-fire alarm listed devices from the communication/power bus. This alleviates the need to conduct a short circuit test on the communication/power bus.

In bullet point 3 of UL's letter, UL is indicating that dual security and fire listed devices are only considered fire alarm products even if security devices are connected to them because they are behaving as an isolation device. This is false and there is no isolation that occurs between the zone expansion module and its required interconnection to the data-bus since a short circuit condition that is introduced onto the data-bus wiring, such as a zone-expansion module, instantly shuts down the combination-listed control unit.

4 • When non-fire alarm devices are directly connected to fire alarm listed devices/products, which are in turn connected to the communication bus, short circuit faults are applied directly to the non-fire alarm devices and the interconnecting wiring to the fire alarm listed devices/products. Compliance is confirmed when the short circuit faults do not affect fire alarm and/or carbon monoxide alarm signaling operation.

In bullet point 4 of UL's letter it states "When non-fire alarm devices are directly connected to fire alarm listed devices/products, which are in turn connected to the communication bus, short circuit faults are applied directly to the non-fire alarm devices and the interconnecting wiring to the fire alarm listed devices/products. Compliance is confirmed when the short circuit faults do not affect fire alarm and/or carbon monoxide alarm signaling operation." In contrast, CSE has demonstrated and verified that compliance could not have been technically confirmed due to the single data-bus method and its requirements to connect all data-bus connected devices in parallel with each other and due to where final power wiring terminations are required to reside on the same terminals of the control unit.

5 • A short circuit fault is applied to the communication/power bus when non-fire alarm devices (for example when a system incorporates a Listed security only keypad or addressable PIR) are directly connected to the communication/power bus.

A short circuit fault condition applied to the data-bus will instantly render the control unit non-functional. Accordingly, this equates to a non-conforming combination-listed control unit. The claim by UL that this is tested is inconsistent with the testing of CSE where a short circuit applied to the data-bus wiring instantly caused the control unit to fail catastrophically.

6 • A short circuit fault is also applied to output power supply circuits when non-fire alarm equipment is directly connected to those circuits. Typically, this includes security devices such as passive infrared motion sensors.

The technical results of CSE's testing and the results of Mr. Zwirn's testing demonstrate that this cannot be an accurate representation by UL. The auxiliary DC power output of the system is required to be connected to the combination-listed control unit at only one location on the systems circuit board. The same holds true for the positive (+) and negative (-) terminals, which reside on the same DC power output terminals that are where the data-bus power connection is required to occur. Consequently, when a short was applied to a motion detector or glass break detector connected to the residential Vista 20P data-bus wiring, the entire control unit catastrophically failed.

As elaborated to in this report, in CSE's testing results, a motion detector and audio glass break detector were connected to a Honeywell Vista-20P control unit and when a short-circuit condition was introduced onto the data-bus it instantly rendered the entire system non-functional. The best evidence to test if the combination-listed control unit is conforming to UL and NFPA standards, is not to just posit it, but it is to scientifically and technically test it. CSE performed said testing which leads to our conclusion that the control units are non-conforming. The system installed at CSE has a motion sensor and glass break detector attached to the system just as any customer would, and a short at this equipment rendered the entire system non-functional.

Based on the totality of results, it is clear the NRTLs are not appropriately testing the combination-listed control units to UL standards and NFPA 72®, so that short circuits in non-fire equipment do not impede the ability of the fire alarm system to respond to fire emergencies. Of equal importance is the presence of combination-listed control units that have already been manufactured and installed in the field that are currently non-conforming. This non-compliance

has been confirmed in CSE's testing whereby a combination-listed system was simply purchased and installed just like any alarm contractor would do for an ordinary consumer, and it does not meet the plain language requirements of the applicable NFPA and UL standards. This indicates that there are combination-listed fire and burglar alarm systems present in the field across the country that do not meet the requirements of the applicable UL and NFPA standards.

SUMMARY OF OPINIONS

Based on the review of the applicable materials, the analysis of codes and standards, as well as the scientific testing conducted by CSE and others, as well as our specialized education, skill, knowledge, training, experience and credentials, CSE has the following expert opinions:

- It has been hypothesized that a short circuit in a non-fire protection device attached to a common data-bus and its wiring can cause a failure of the entire fire alarm system. The hypothesized failure mode of the data-bus in commercial combination-listed burglar and fire alarm systems was confirmed for Honeywell's Vista 32FBPT. A short circuit condition in the wireless receiver of this system caused the entire system to catastrophically fail. This violates both UL and NFPA standards.
- An electrical short circuit condition that was introduced onto the (+) and (-) power feeding a 4-wire smoke detector on the commercial Vista 32FBPT caused not only the smoke detector to become non-functional, but it also caused the entire system to catastrophically fail.
- The use of the ECP isolator on the Honeywell Vista 32FBPT mostly protected much of the system from short circuit failure. Nevertheless, an ECP isolator is not included in the purchase of this control unit, and it did not isolate the systems wireless receiver or a 4-wire smoke detector that was connected to this control unit as part of the CSE testing.
- The failure of the wireless receiver on the commercial Vista 32FBPT violates UL 864 directly. Additionally, it violates NFPA 72®, particularly since only security devices could be connected wirelessly to the wireless receiver.

- CSE's electrical short circuit testing on the single data-bus and/or on the data-bus wiring and/or on any of the data-bus connected devices using the Honeywell Vista 20P household combination-listed control unit caused the entire system to catastrophically fail.
- The fact that shorts on most or all pieces of equipment on CSE's testing of the Honeywell Vista 20P combination-listed system caused the entire system to fail catastrophically directly violates both NFPA 72® and UL 985 Standards.
- The testing in this project confirms the previous testing by Mr. Zwirn of different manufacturers control units including the Honeywell Vista control units that were tested by CSE.
- The catastrophic failure of the Vista 20P was further complicated by the fact that if the short persisted for more than 10 seconds, the system did not restore properly upon removal of the short and required a full reboot by removing AC power and unplugging the battery. This could cause the system to remain non-functional for a significant period of time until a technician can visit the residence. This would also be the situation if the system failed due to fire exposure in a wall.
- The CSE testing of the Vista 20P residential system indicates that, for some reason, UL is getting very different results than that demonstrated by Mr. Zwirn in his videos and expert report and scientifically identified and confirmedin this current testing series. The testing by UL is not ensuring compliance with the applicable NFPA and UL standards.
- The results of the testing herein are not solely attributable to Honeywell systems. Mr. Zwirn has indicated in his videotaped testing that many other listed systems have similar issues. Therefore, there may be many systems currently installed that suffer from these same non-conformity dangers.

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Underwriters Laboratories (UL) Standard 1023. Household Burglar-Alarm System Units. 6th edition. 1996. With changes through 07/01/2013.

Underwriters Laboratories (UL) Standard 1023. Household Burglar-Alarm System Units. 7th edition. 2017.

Appendix A

List of Reviewed Materials

- YouTube videos from "The Alarm Panel Recall Channel", various dates
- YouTube webinar by Kirschenbaum & Kirschenbaum, Attorneys at Law, dated 2/16/2021
- Expert report of Jeffrey D. Zwirn, says "Combustion Science & Engineering, Incorporated" in the footer, dated 2/14/2022
- Expert report of Jeffrey D. Zwirn, says "To: Mr. Dale R. Wheeler, PE, Principal, Systech Fire Protection, LLC" in the footer, dated 2019
- UL Letter of Larry Shudak to Jeffrey Zwirn, dated 12/18/2020
- CV of Merton W. Bunker, no date
- Peer-review letter of Merton Bunker, dated 9/9/2019
- Peer-review letter of Merton W. Bunker, dated 1/21/2021
- Annex A – Merton Bunker publication, no date
- Annex 1 – Applicable Sections of NFPA 72® and UL Standards, no date
- "Zwirn responds to Johnson Controls letter" video link, dated 4/12/2021
- "Johnson Controls Violates 6th Edition of UL-985 as Described by Intertek" with link to PDF, dated 4/12/2021
- David A. Forkner letter to Jonathan S. Goodgold and Jeffrey D. Zwirn, dated 3/30/2021
- "Johnson Controls Employee Confirms Non-Conformity", dated 4/12/2021
- David A. Forkner letter to Robert J. Cosgrove and Matthew C. Care, dated 4/28/2021
- Robert J. Cosgrove and Matthew C. Care letter to David A. Forkner, dated 4/12/2021
- ADI catalog page with Honeywell Home Intrusion devices, no date
- NFPA Technical Question from Jeffrey Zwirn, dated 9/17/2021 and response from NFPA (Christopher Coache), dated 9/21/2021
- Honeywell Ademco VISTA-20P Series/VISTA-15P Series Security Systems Quick Installation Guide, dated 3/15 (Rev C)
- NFPA Technical Question response of Richard Roux dated 4/6/2021 to a question submitted by Jeffrey Zwirn dated 3/31/2021
- Equipment Manufacturers Specifications Honeywell Vista 20P
- Equipment Manufacturers Specifications Honeywell Vista 32FBPT
- Honeywell catalog cutsheet for Ademco Commercial Wireless Receiver, no date

- CV of Jeffrey Zwirn
- Letter report of Zygmunt Staszewski, PE, FSFPE, ZS Engineering DPC, dated 5/1/2022

Appendix B

Curriculum Vitae and Lists of Publications

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STEPHEN M. OLENICK, MSFPE, MBA, P.E., CFEI

EDUCATION:

B.S., Fire Protection Engineering, University of Maryland, College Park, MD, May 1998
M.S., Fire Protection Engineering, University of Maryland, College Park, MD, December 1999
M.B.A., Loyola University, Baltimore, MD, December 2011

THESIS:

Olenick, S.M., "Validation of the Forced Flow Ignition and Flame Spread Test (FIST), A Reduced Scale Test Apparatus, to Assess Material Flammability for Micro-Gravity Environments," University of Maryland, College Park, Maryland, December 1999.

PROFESSIONAL EXPERIENCE:

Principal Engineer, Combustion Science & Engineering, Inc., Columbia, MD, 2011-present.

Responsible for conducting fire investigations and fire hazards analysis, providing fire litigation support, and utilizing computer fire modeling including both zone models and computational fluid dynamics (CFD). Litigation experience includes both criminal and civil cases involving residential, commercial, and industrial fires. Conducted various site fire investigations that cover a wide range of structural settings including residential, commercial, and industrial facilities. Performed model validation of both zone and CFD models to determine error limits and accuracy of models in various scenarios. Participated in numerous projects funded by government grants (NASA, NIST, etc.) to determine methodologies for modeling smoke detector activation. Responsible for providing leadership and managerial duties on numerous computational and experimental projects, as well as overseeing and reviewing many computational simulations.

Senior Engineer, Combustion Science & Engineering, Inc., Columbia, MD, 2005-2011.

Project Engineer, Combustion Science & Engineering, Inc., Columbia, MD, 2000-2005.

Graduate Research Assistant, University of Maryland, College Park, MD, 1998-1999.

Responsible for design, construction, and operation of the FIST apparatus to characterize the combustion of solid materials in micro-gravity. Funded by NASA and conducted under the supervision of Professor Dr. Jose Torero.

Undergraduate Research Assistant, University of Maryland, College Park, MD, 1997-1998

Responsible for investigating the effect of weathering on the flash point of crude oil. Funded by NIST and conducted under the supervision of Professor Dr. Jose Torero and graduate student Neil Wu.

PROFESSIONAL REGISTRATION:

Registered Professional Engineer (Fire Protection), State of Delaware, No. 13131
Certified Fire and Explosion Investigator (CFEI), National Association of Fire Investigators, No. 7461-4946

HONORS:

Fire Technology Jack Watts Award for Outstanding Reviewer, 2017
National Fire Protection Research Foundation William M. Carey Award for best presentation, SUPDET, 2007
NFPA Harry C. Bigglestone Award for Excellence in Communication of Fire Protection Concepts, 2005.

PROFESSIONAL STANDING:

Memberships:
Member, Salamander Honorary Fire Protection Engineering Society, Beta Chapter
Member, Society of Fire Protection Engineers (SFPE)
Member, National Fire Protection Association (NFPA)
Member, International Association of Arson Investigators (IAAI)
Member, National Association of Fire Investigators (NAFI)
Member, International Association of Fire Safety Science (IAFSS)

Committees:
Chair, Standard for the Installation of Fuel Gases Detection and Warning Equipment (NFPA 715) Technical Committee on Fuel Gases Warning Systems, 2019-present
Principal, National Fire Alarm and Signaling Code (NFPA 72) Technical Committee on Single- and Multiple-Station Alarms and Household Fire Alarm Systems (SIG-HOU), 2005-present
Principal, Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment (NFPA 720) Technical Committee on Carbon Monoxide Detection, 2012-2017
Member, SFPE Task Group on Computer Model Evaluation, 2000-2010

Journals and Conferences:
Editorial Board, *Fire Technology*, 2016-present
Guest Editor for Special Section on Detection for *Fire Technology*, 2010 (v.46, n.3)
Member, Programme Committee, National Fire Protection Research Foundation SUPDET, 2008
Reviewer, *Fire Technology*
Reviewer, *Fire Safety Journal*
Reviewer, *Fire & Materials*
Reviewer, IAFSS *International Symposium on Fire Safety Science*

SELECTED PRESENTATIONS AND PUBLICATIONS:

Presentations:

Olenick, S., Klassen, M., and Boehmer, H., "Changing Hazards of Modern Vehicles in Parking Structures", NFPA 125th Anniversary Conference Series, November 2021.

Olenick, S.M., "NFPA 715 – Standard for the Installation of Fuel Gases Detection and Warning Equipment: Where We've Been, Where We Are, and Where We're Going", National Electrical Manufacturers Association (NEMA) SB/SB2 Industry Day, October, 2021.

Klassen, M., Olenick, S., and Boehmer, H., “Modern Vehicle Hazards in Parking Structures and Vehicle Carriers”, SFPE Annual Conference & Expo, Baltimore, Maryland, October, 2021.

Davis, S.G. and Olenick, S.M., “Combustible Gas Dispersion and Detector Location Analysis in Residential Occupancies”, NFPA webinar, March, 2021.

Boehmer, H., Klassen, M., and Olenick, S., “Modern Vehicle Hazards in Parking Structures and Vehicle Carriers”, International Conference on Fire in Vehicles (FIVE), December, 2020.

Boehmer, H., Klassen, M., and Olenick, S., “Parking Structures and Life Safety: Keeping Pace With Modern Vehicle Hazards”, presentation to the NFPA 88A Technical Committee, October, 2020.

Olenick, S.M., Boehmer, H., and Klassen, M.S., "Door Messaging Strategies: Implications for Detection and Notification", NFPA Fire Protection Research Foundation Suppression, Detection and Signaling Research and Applications Symposium (SUPDET), September, 2019.

Olenick, S.M., Boehmer, H.R., and Klassen, M.S., “Door Messaging Strategies - Researching the Options”, NFPA Research Foundation Door Messaging Strategies Workshop, July, 2019.

Olenick, S.M., Boehmer, H.R., and Klassen, M.S., “Door Messaging Strategies - Researching the Options”, NFPA Conference & Expo, San Antonio, June, 2019.

Martin, G., Boehmer, H.R., and Olenick, S.M., "Thermally-Induced Failure of Smoke Alarms", presented at the 16th International Conference on Automatic Fire Detection (AUBE '17) and the National Fire Protection Association Research Foundation’s Suppression, Detection and Signaling Research and Applications Symposium (SUPDET 2017) joint conference, September, 2017.

Martin, G., Boehmer, H.R., and Olenick, S.M., “Thermally-Induced Failure of Smoke Alarms”, IAFSS 12th International Symposium on Fire Safety Science, June, 2017. (poster presentation)

Olenick, S.M., Roby, R.J., Carpenter, D.J., and Goodman, A., "Evaluation of the NFPA 72 Spacing Requirements for Waffle Ceilings", National Fire Protection Research Foundation Suppression and Detection Research and Applications Symposium (SUPDET 2008), Orlando, Florida, March 2008.

McAllister, J. and Olenick, S.M., “Smoke Detection Systems, Fire Modeling, and Fire Toxicology: Useful Tools in Fire Investigation and Reconstruction,” Cozen O’Connor Continuing Legal Education seminar, April, 2007.

Sutula, J., Klassen, M., Roby, R, Olenick, S., Gaines, G. and Torero, J., “Flame Extinction Based on a Critical Damköhler Number for the Assessment of Suppression Effectiveness in Reduced Gravity Environments,” Presented at the 5th International Seminar on Fire and Explosion Hazards, Edinburgh, Scotland, April 23-27, 2007.

Milarcik, E.L, Olenick, S.M., and Roby, R.J., “An Analysis of the Performance of Residential Smoke Detection Technologies Utilizing the Concept of Relative Time,” presented to the National Fire Protection Research Foundation Suppression and Detection Research and Applications Symposium (SUPDET), March, 2007. (2007 Carey award)

Olenick, S.M., Roby, R.J., Klassen, M.S., Zhang, W., Sutula, J.A., Worrell, C., Wu, D., D'Souza, V., Ashley, A., Dubois, J., Torero, J.L., and Streit, L., "The Role of Smoke Detectors in Forensic Fire Investigation and Reconstruction," presented to the International Symposium on Fire Investigation Science and Technology (ISFI), June 26-28, 2006.

Sutula, J.A., Klassen, M.S., Roby, R.J., Olenick, S.M., Gaines, G., Chakraborty, A., and Torero, J.L., “Development of an Engineering Tool for Determination of Suppression Device Placement in Reduced Gravity Environments” Habitation 2006 Conference, Orlando, February, 2006.

Gaines, G., Roby, R., Klassen, M., Zhang, W., Olenick, S., and Torero, J., "An Algorithm to Predict Smoke Detector Activation in a Forced Flow Microgravity Environment" Habitation 2006 Conference, Orlando, February, 2006.

Ma. T., Olenick, S.M., Klassen, M.S., Roby, R.J., and Torero, J.L., "Carpet Under Fire: A Forensic View on the Role of Carpet (Porous Media) in Liquid Spill Fires", Harry C. Bigglestone Award Presentation, NFPA World Safety Conference and Exposition, Las Vegas, June, 2005.

Olenick, S.M., Zhang, W., Carpenter, D. J., Roby, R. J., and Klassen, S. M., "Verification and Validation of a Smoke Detector Activation Algorithm for the Fire Dynamics Simulator (FDS)", presented to the NFPA Fire Protection Research Foundation Fire Suppression and Detection Research Application Symposium, Orlando, January, 2005.

Stephen M. Olenick, Noah L. Ryder, and Jason A. Sutula, "Computer Modeling of a Controlled Full Scale House Burn with Fire Dynamics Simulator: Construction of a Complex Geometry and Comparison of Predictions with Experimental Data," presented to the NFPA World Safety Conference and Exposition, Dallas, May, 2003.

Stephen M. Olenick, Jason A. Sutula, Richard J. Roby, and Vijay T. D'Souza, "Modeling of Smoke Detector and Sprinkler Activation," presented to the NFPA Fire Protection Research Foundation's Fire Suppression and Detection Research Application Symposium; January, 2003.

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Olenick, S.M., Boehmer, H., and Klassen, M.S., " Door Messaging Strategies: Implications for Detection and Notification". Extended Abstract. Proceedings of the NFPA Fire Protection Research Foundation Suppression, Detection and Signaling Research and Applications Symposium (SUPDET), 2019.

Martin, G., Boehmer, H., and Olenick, S.M., "Thermally-Induced Failure of Smoke Alarms," *Fire Technology*, v52, n2, 2020. https://doi.org/10.1007/s10694-019-00898-6 including erratum (https://doi.org/10.1007/s10694-019-00913-w). Added to *Fire Technology* Editors' Choice Topical Collection for having special significance.

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Havey, P., Jaquay, J.T., Holton, M.M., Hussain, N. and Olenick, S.M., "Persistence of Sonic Deposition on Smoke Alarms in Forensic Fire Investigations," *Fire Technology*, v54, n6, 2018. https://doi.org/10.1007/s10694-018-0761-8

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J.L. Torero, S.M. Olenick, J.P. Garo and J.P. Vantelon, “Determination of the Burning Characteristics of a Slick of Oil on Water”, *Spill Science and Technology Bulletin*, v.8, 4, 2003.

Stephen M Olenick and Douglas J. Carpenter, “An Updated International Survey of Computer Models for Fire and Smoke,” *SFPE Journal of Fire Protection Engineering*, v. 13, n. 2, 2003.

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Maclain M. Holton, Stephen M. Olenick, Michael S. Klassen, and Richard J. Roby, “A Study of the Effectiveness of Passive Infrared Burglar Alarms to Detect Fires and Smoke,” Proceedings of The Fire Protection Research Foundation: The Fire Suppression and Detection Research Application Symposium, Tampa, FL, January, 2002.

Vijay T. D'Souza, Jason A. Sutula, Stephen M. Olenick, Wei Zhang, and Richard J. Roby, "Use of the Fire Dynamics Simulator to Predict Smoke Detector Activation," Proceedings of the Fall Technical Meeting of the Eastern States Section of the Combustion Institute, December, 2001.

M. Roslon, S. Olenick, Y. Y. Zhou, D. C. Walther, J.L. Torero, A.C. Fernandez-Pello and H. D. Ross, "Micro-Gravity Ignition Delay of Solid Fuels in Low Velocity Flows," *AIAA-Journal,* v. 39, n. 12, December, 2001.

Stephen M. Olenick, Michael S. Klassen, and Richard J. Roby, "Validation Study of FDS for a High-Rack Storage Fire Involving Pool Chemicals," Final Proceedings, SFPE 3rd Technical Symposium on Computer Applications in Fire Protection Engineering, September, 2001.

N. Wu, T. Mosman, S. M. Olenick and J. L. Torero, "The Effect of Weathering on Piloted Ignition and Flash Point of a Slick of Oil," *Spill Science and Technology Bulletin,* (submitted).

M. Roslon, S. Olenick, D. Walther, J.L. Torero, A.C. Fernandez-Pello and H. Ross "Microgravity Ignition Delay of Solid Fuels in Low Velocity Flows," Proceedings of the Spring Meeting of the Western States Sections, The Combustion Institute, Boulder, Colorado, March 2000.

M. Roslon, S. Olenick, D. C. Walther, J. L. Torero, A. C. Fernandez-Pello and H. D. Ross, "Flow Effects on the Micro-Gravity Ignition Delay of Solid Fuels," *38th AIAA Aerospace Science Meeting,* Reno, Nevada, January, 2000.

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MICHAEL S. KLASSEN, Ph.D., P.E.

EDUCATION:

Ph.D., Mechanical Engineering, University of Maryland, 1992.
M.S., Mechanical Engineering, University of Maryland, 1990.
B.S., Mechanical Engineering, University of Maryland, 1987.

PROFESSIONAL EXPERIENCE:

Vice President and Principal Research Engineer, Combustion Science & Engineering, Inc., Columbia, MD, 1998 to present.

Responsible for the design and execution of experimental and analytical projects in fire and combustion research. Technical lead for gas turbine combustor design. Developed analytical technique for prediction of flameholding potential in gas turbine combustors. Developed reduced chemical kinetic schemes for prediction of heat release and pollutant formation in gas turbine combustors. Developed analytical techniques for prediction of radiative loading in gas turbines for enhanced lifeing predictions of liners. Conducted small-scale experimental study to measure radiative loading of combustor walls to provide validation data for analytical study. Conducted small-, medium- and large-scale testing on the transmission of radiation and breakage properties of glazing materials. Provide engineering support for litigation cases. Conduct fire and hazard investigations.

Vice President and Chief Technical Officer, LPP Combustion LLC, Columbia, MD, 2007-present.

Developing and commercializing innovative technology for clean combustion of liquid fuels. Co-inventor of technology. Responsible for technical development of technology, working with staff of engineers to test, design and commercialize methodology and apparatus. Closely involved in business development, including company capitalization, organization and day-to-day operation.

Staff Engineer, Hughes Associates, Inc., Baltimore, MD, 1996-1997.

Designed and conducted experimental fire and combustion research. Involved in the testing and modeling of fire-suppression systems.

Visiting Asst. Professor/Postdoctoral Researcher, Purdue University, 1992- 1996.

Developed laser and optical diagnostic techniques for use in combustion applications. Utilized these techniques to investigate the formation of minor combustion species and pollutants in laminar and turbulent flames. Conducted experiments into the effect of pressure on nitric oxide (NO) formation in flames at pressures ranging from 1 to 15 atm. Local NO concentration measurements were made in laminar flames using laser-induced fluorescence (LIF) and used to evaluate the ability of current chemical kinetic mechanisms to predict NO formation in high-pressure flames. Instantaneous, local NO concentrations were also measured in premixed, turbulent jet flames which gave insights into the regions of NO formation in this type of flame and provided data for model validation. Further research involved the use of picosecond time-resolved laser-induced fluorescence (PITLIF) to the determine instantaneous, quantitative concentration of minor species in turbulent flames. This study involved the application of ultra-fast spectroscopic techniques

(resolution on the order of nanoseconds) in order to make time-series measurements of minor species concentrations in turbulent reacting flows. Lectured on introductory engineering thermodynamics.

Graduate Research Assistant, University of Maryland, 1989-1992.

Research involved the study of radiation properties and the flame structure of liquid-fuel pool flames. This work included measurements of the total radiative output, fuel burning rate and flame height for a variety of burner diameters (5 cm- 1 m). A new technique to measure radiative heat transfer from the flame to the fuel surface was developed. Instantaneous and simultaneous measurements of temperature, intensity and soot volume fraction were made using an optical pyrometric technique. Stochastic simulations using the measured instantaneous flame properties were employed for predictions of radiative output from the flame and the fuel burning rate.

Guest Researcher, National Institute of Standards and Technology, U.S. Department of Commerce, Center for Building and Fire Research, 1989 -1992.

Guest Researcher, Fire Research Institute, Department of Home Ministry, Tokyo, Japan, 1991.

Graduate Research Assistant, University of Maryland, 1988-1989.

Conducted research which investigated the transient cooling of hot surfaces by dropwise evaporation for use in fire suppression models. An infrared thermographic technique was developed to monitor the response of a heated low-conductivity surface to an impinging water droplet. Digital image processing techniques were utilized to extract the extent of cooling of the surface by the droplet and the transient surface temperature from the infrared data.

PROFESSIONAL REGISTRATION:

Registered Professional Engineer, Mechanical Engineering, License Number 23107 (Maryland).

PROFESSIONAL STANDING:

Member, The American Society of Mechanical Engineers
Member, The Combustion Institute
Member, AIAA
Member, Combustion and Fuels Committee, International Gas Turbine Institute
Vice Chairman, International Gas Turbine Institute (ASME) Combustion, Fuels and Emissions Committee (current)
Member, NGC+ Work Group on Interchangeability

HONORS:

Harry C. Bigglestone Award presented by *Fire Technology* (2007)
NFPA Harry C. Bigglestone Award for Excellence in Communication of Fire Protection Concepts, 2005.

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Roby; R. J., Klassen; M. S., Schemel; C. F. "System for vaporization of liquid fuels for combustion and method of use", US Patent 8,225,611, 2012

Joklik; R. G., Roby; R. J., Klassen; M. S.., Battaglioli; J. L., Hamer; A. J., Vashishat; D., "System and method for flame stabilization and control", US Patent 7,934,924, 2011.

Klassen, M., Gokulakrishnan, P., Fuller, C., Hamer, A., Ware, C., and Langdon, J., "System, Method and Apparatus for Hydrogen-Oxygen Burner in Downhole Steam Generator", US Patent 7770646, 2010.

Roby; R. J., Klassen; M. S., Schemel; C. F. "System for vaporization of liquid fuels for combustion and method of use", US Patent 7,770,396, 2010.

Roby, R., Klassen, M., and Schemel C., "System for vaporization of liquid fuels for combustion and method of use", U.S. Patent 7322198, 2008.

Joklik, R. G., Roby, R. J., Klassen, M. S., Battaglioli, J. L., Hamer, A. J., Vashishat, D., "System and Method for Flame Stabilization and Control", U.S. Patent No. 7,435,080, 2008.

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Roby, R., Klassen, M., DuBois, J., Gaines, G., Ashley, E., "Method and apparatus for waking a person", U.S. Patent 7170397, 2007.

Roby, R., Klassen, M., and Schemel C., "System for vaporization of liquid fuels for combustion and method of use", U.S. Patent 7,089,745, 2006.

Roby, R., Klassen, M., Schemel, C., Vashishat, D., Holton, M., and Flint, K., "Method and apparatus for indicating activation of a smoke detector alarm", U.S. Patent 7015807, 2006.

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EDUCATION:

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PROFESSIONAL EXPERIENCE:

Project Engineer, Combustion Science & Engineering, Inc., Columbia MD, 2021 – Present.
Responsible for designing and executing experimental projects in fire and combustion research. Experience in designing and fabricating experimental apparatuses and parts using CAD and machine tools. Participate in residential, commercial, and industrial fire and hazard investigations. Perform calculations, experimentation, and analysis supporting fire and carbon monoxide incident litigation. Responsible for creating industrial system design drawings and part models. Conducted system efficiency and improvement testing on liquid process and power systems. Manage UL code compliance and technical development for smoke alarm accessory technology SafeAwake.

Staff Engineer, Combustion Science & Engineering, Inc., Columbia MD, 2017 – 2021.

Engineering Technician, Combustion Science & Engineering, Inc., Columbia MD, 2016 – 2017.

Research Assistant, NAVAIR, Patuxent River, MD, 2013.
Conducted research, recorded, and analyzed data at a naval research lab in the area of Raman spectroscopy in order to improve naval gyroscope equipment.

Appendix C

Codes and Standards Matrices

NFPA 72® National Fire Alarm and Signaling Code®

Household

Standard Text (or similar)	Edition									
	2022	2019	2016	2013	2010	2007	2002	1999	1996	1993
Faults in other systems or components shall not affect the operation of the fire alarm system.	29.10.7.5	29.10.7.5	29.7.7.4	29.7.7.4	29.7.6.4	11.7.6.4	11.7.6.4	8-2.1.4	----	----
Where common wiring is employed for a combination system, the equipment for other than the fire and carbon monoxide alarm system shall be connected to the common wiring of the system so that short circuits, open circuits, grounds, or any fault in this equipment or interconnection between this equipment and the fire and carbon monoxide alarm system wiring does not interfere with the supervision of the fire and carbon monoxide alarm system or prevent alarm or trouble signal operation.	29.10.7.6	29.10.7.6 (carbon monoxide added)	29.7.7.5	29.7.7.5	29.7.6.5	11.7.6.5	11.7.6.5	----	2-4.7.1	2-4.7.1 and notes it comes from NFPA 74-1989 4-7.1

NFPA 72® National Fire Alarm and Signaling Code®

Protected Premises (Commercial)

Standard Text (or similar)	Edition									
	2022	2019	2016	2013	2010	2007	2002	1999	1996	1993
If the equipment is attached to the fire alarm system via separate pathways, then short circuits or open circuits in this equipment, or between this equipment and the fire alarm system pathways, shall not impede or impair the monitoring for integrity of the fire alarm system or prevent alarm, supervisory, or fire safety control signal transmissions.	23.8.4.4.2	23.8.4.4.2	23.8.4.3.2	23.8.4.3.2	23.8.4.3.1.2	----	----	----	----	----
Short circuits, open circuits, or grounds in this equipment or between this equipment and the fire alarm system wiring shall not interfere with the monitoring for integrity of the fire alarm system or prevent alarm, supervisory, or fire safety control signal transmissions.	----	----	----	----	----	6.8.4.3	6.8.4.3	Is part of 3-8.2.2	Is part of 3-8.13.2	Is part of 3-8.14.2 and notes it comes from NFPA 72-1990 3-6.2 and was modified
All non-fire alarm components of a combination system shall be listed for fire alarm use unless removal, replacement, failure, or maintenance procedure on any non-fire alarm hardware, software, or circuits does not impair the required operation of the fire alarm system.	----	----	----	----	----	6.8.4.4	Similar but slightly different language	Similar language in 3-8.2.3	Similar language in 3-8.13.3	Similar language in 3-8.14.3 and notes it comes from NFPA 72-1990 3-6.3
When a non-fire system is combined with the fire alarm system using a data transmission method such as EIA232 serial data, isolation of the interconnect circuitry is essential to proper operation. Methods for isolating the non-fire alarm system may include isolation wiring methods or a barrier to prevent failure of the fire alarm system functions due to transfer of wiring faults between the systems. It is also important to consider the adverse impact on the fire alarm system caused by excessive traffic on the communications link.	----	----	----	----	----	A.6.8.4.3	----	----		

UL 365 Police Station Connected Burglar Alarm Units and Systems

Standard Text (or similar)	Edition	
	4th edition (1997) with changes through 9/17/2010	5th edition (2018)
Equipment intended for combination burglar-alarm and fire-protective signaling systems is also expected to comply, with the Standard for Control Units for Fire-Protective Signaling Systems, UL 864.	1.6	1.6

UL 864 Control Units and Accessories for Fire Alarm Systems

Standard Text (or similar)	Edition	
	9th edition (2003) with changes through 8/31/2012	10th edition (2014) with changes through 3/29/2018
When a fire alarm system shares components, equipment, circuitry, and installation wiring with non-fire systems, short circuits, open circuits, or grounds in the non-fire system equipment or the connections between the non-fire system equipment and the fire alarm products shall not impair the required operation of the fire alarm system or prevent appropriate alarm, supervisory, or trouble annunciation and signaling, or unfaulted fire-safety control activation	56.1 – notes effective 12/31/2008	----
To determine compliance with 56.1, the operation, removal, replacement, failure, or maintenance procedure on any hardware, software, or circuit not performing any of the fire alarm system functions shall not cause loss of any of the fire alarm functions, including supervision, or prevent required alarm, supervisory, trouble, or fire-safety annunciation, signaling, or actuation.	56.2 – notes effective 12/31/2008	----
Short circuits or open circuits in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall not impede or impair the monitoring for integrity of the fire alarm system as described in Common Performance and Monitoring for integrity – Protected-Premises Units/Systems Section 56, nor impede or impair any fire alarm signal transmissions or operations	----	61.1.7
Single ground faults in the non-fire alarm equipment shall not impede or impair the monitoring for integrity of the fire alarm system, or impede or impair any fire alarm, supervisory or trouble signal transmissions or operation.	----	61.1.8
The required operation of the fire alarm equipment shall not be impaired by any failure of the non-fire alarm equipment hardware, software or circuits, or by any maintenance procedure, including removal or replacement of defective equipment or powering down of the non-fire equipment.	----	61.1.9

UL 985 Household Fire Warning System Units

Standard Text (or similar)	Edition	
	5th edition (2000) with changes through 10/31/2008	6th edition (2015) with changes through 7/12/2018
When common wiring is used for combination systems, it shall be connected in such a manner that internal fault conditions (shorts, opens, grounds) in the nonfire alarm (burglary) system circuit wiring, or faults between the fire and nonfire alarm system circuits, will not interfere with the supervision of the fire alarm system or prevent intended alarm signal transmission.	Part of 1.4	Part of 1.4
In a combination control unit, separate circuits shall be used for fire alarm initiating devices and other than fire alarm (burglary) devices.	37.4	----
An open or ground fault in any circuit extending from a household control unit, other than the initiating device circuit, shall not affect the operation of the control unit except for the loss of the function extending from the circuit.	41.4	44.2.2
A fault condition, open ground, or short of other than a fire alarm circuit of a combination control unit shall not affect the fire-alarm signaling.	41.6	----
Short circuit or open circuit single faults in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall not impede or impair the monitoring for integrity of the fire alarm system, nor impede or impair any fire alarm signal transmissions or operations.	----	41.3.1.3
The required operation of the fire alarm equipment shall not be impaired by any failure of the nonfire alarm equipment hardware, software or circuits, or by any maintenance procedure, including removal or replacement of defective equipment or powering down of the non-fire equipment.	----	41.3.1.6

UL 1023 Household Burglar-Alarm System Units

Standard Text (or similar)	Edition	
	6th edition (1996) with changes though 7/1/2013	7th edition (2017)
These requirements also apply to the use of combination systems, such as a combination fire-burglar-alarm system control unit. A combination system is connected in such a manner that fault conditions (shorts, open, grounds) in the burglar-alarm system circuit wiring, or interconnection between the fire- and burglar-alarm system circuits, will not interfere with the supervision of the fire alarm system or will not prevent intended alarm signal operation.	1.3	1.3
A combination household fire and burglar alarm system shall also comply with the Standard for Household Fire Warning System Units, UL 985.	1.3.1 – notes added June 1, 1999	1.4

Appendix D

UL Letter

December 18, 2020

Mr. Jeffrey D. Zwirn
President
IDS Research and Development, Inc.
46 W. Clinton
Tenafly, NY 07670

via e-mail to jeffzwirn@alarmexpert.com

Re: Your October 15, 2020 Letter

Dear Mr. Zwirn:

UL has reviewed both your October 15, 2020 letter and the accompanying "forensic expert report". This is in response to the technical matters you raised, however, regarding your complaint about UL public relations team visiting your public LinkedIn page, I will simply note that this is publicly available information

Regarding your claims that UL has not properly performed its certification functions, we have to respectfully disagree based on the following points regarding to the application of UL and NFPA Standards and Codes governing these products:

- Both Chapter 29 of NFPA 72, the National Fire Alarm and Signaling Code, and UL 985 stipulate that a wire to wire (short circuit) fault is to be applied only where non-fire alarm equipment is directly interconnected to the fire alarm system.
    - UL 985, 6th edition published 2015 (Nov 2019 effective date) states:
      Section 41.3.1.3 *Short circuit or open circuit single faults in the non-fire equipment or in the wiring between the non-fire equipment and the fire alarm system shall not impede or impair the monitoring for integrity of the fire alarm system, nor impede or impair any fire alarm signal transmissions or operations.*

- Circuits interconnecting only fire alarm equipment are not required by UL 985 to be subjected to a short circuit fault. This includes your example of an attack by fire, specifically resulting in a short circuit fault on the data/power bus. Neither NFPA 72, Chapter 29, nor UL 985 include requirements with respect to household fire alarm system pathway survivability to attack by fire.

  As a UL STP member, you are aware that you can submit a proposal to the appropriate UL STP(s) for their consideration to add such a requirement.

UL applies clause 41.3.1.3 as follows:

- Products/devices may additionally include security listing in addition to fire alarm listing when both fire and security signals can be processed by the product. An example includes zone expanders. These products connected directly to the communication/power bus are considered fire alarm products, even where only separate security devices are interconnected to them. In this instance the combination fire and security product/device is functioning as an isolation device. The device is isolating non-fire alarm listed devices from the communication/power bus. This alleviates the need to conduct a short circuit test on the communication/power bus.
- When non-fire alarm devices are directly connected to fire alarm listed devices/products, which are in turn connected to the communication bus, short circuit faults are applied directly to the non-fire alarm

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devices and the interconnecting wiring to the fire alarm listed devices/products. Compliance is confirmed when the short circuit faults do not affect fire alarm and/or carbon monoxide alarm signaling operation.

- A short circuit fault is applied to the communication/power bus when non-fire alarm devices (for example when a system incorporates a Listed security only keypad or addressable PIR) are directly connected to the communication/power bus.

- A short circuit fault is also applied to output power supply circuits when non-fire alarm equipment is directly connected to those circuits. Typically, this includes security devices such as passive infrared motion sensors.

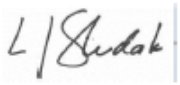
While your forensic report focuses on Chapter 29 of NFPA 72 and UL 985/UL 1023, the installation and performance requirements for commercial premises are addressed in NFPA 72, excluding Chapter 29, and UL 864, Standard for Safety Control Units and Accessories for Fire Alarm Systems. Chapters 10, 12, 23, 24 and 26 of NFPA 72 and UL 864 do not include identical requirements to those in Chapter 29 of NFPA 72 and UL 985, respectively.

With respect to commercial premise fire alarm control unit system installation, sections 23.10 and 24.3.14.4 of NFPA 72 – 2019 are clear that pathway survivability to attack by fire is applicable only for systems employing relocation or partial evacuation of occupants. Associated section 12.4 of NFPA 72 – 2019 stipulates the pathway survivability to attack by fire can be accomplished by physical protection of the pathway or the use of CI cable rather than by inherent operational capabilities of the fire alarm systems.

Lastly, and equally importantly, UL has not received information of field incidents associated with these products. If you have personal knowledge of UL Listed products failing in the field, these instances should be reported to our Market Surveillance team. This way UL can independently review those alleged failures.

We encourage you to continue to avail yourself to the UL STP Standards development process. As a result, we have also forwarded your letter to Ms. Scanlon and the accompanying "expert report" to Diane Haithcock, the STP chair for UL 985.

Very truly yours,



Lawrence J Shudak, P.E.
Principal Engineer – Life Safety Technologies, UL LLC

Cc: Dwayne Sloan, PDE Director, UL LLC

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Appendix E

Merton Bunker Letters

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To Whom It May Concern:

My name is Merton Bunker, PE, CFII, DBIA and I am the President of Merton Bunker and Associates in Stafford, Virginia. I have attained extensive and specialized education, skill, knowledge, training, experience and credentials in the fire alarm industry, UL Standards, NFPA 70 *National Electrical Code®*, and NFPA 72 *National Fire Alarm and Signaling Code®*. I hold a Bachelor of Science in Electrical Engineering (BSEE) and a Master of Science in Engineering Management (MSEM). I have 34 years of engineering experience including 7 years at the National Fire Protection Association (NFPA).

From 1994 to 2001, I was employed by the National Fire Protection Association in Quincy MA, where I was staff liaison to NFPA 72 and other NFPA standards. As staff liaison, I was also the co-editor of the NFPA 72 Handbook®. Furthermore, I was the Chief Electrical Engineer for the NFPA being responsible for the development of the *National Electrical Code®* from 1998 to 2001. I am the current chair of the NFPA 72 Correlating Committee and serve on the Technical Committee on Protected Premises Signaling Systems. Finally, I have instructed NFPA's fire alarm code seminars since 1994.

I am a licensed professional engineer in eleven (11) states (ME, NH, MA, MD, DC, PA, VA, IN, NC, GA, FL). I am Certified Fire Investigator (NAFI & Pro Board), a Master Electrical Inspector (IAEI), and I conduct forensic investigations.

Against the foregoing backdrop, I have been retained to peer review and technically analyze the Expert Report of Jeffrey D. Zwirn, President of IDS Research and Development, Inc. Upon the conclusion of my analysis, I was retained to provide expert opinions within a reasonable degree of professional, fire alarm science and engineering certainty. As part of my investigation I forensically analyzed and technically reviewed UL-1023, UL-985, UL-365, UL-864- 10th Edition, NFPA 70, and NFPA 72. Each of the editions which I relied upon for UL and NFPA Standards are the same editions that Mr. Zwirn has incorporated into the Standards and Codes Matrix Sections of the Zwirn Expert Report. Furthermore, I forensically tested an exemplar single data-bus control panel following the codes and standards referenced in the Zwirn Expert Report.

EXPERT OPINIONS:

1) I technically duplicated, validated and verified what Mr. Zwirn opined with regards to the multitude of dangerous and unreliable "non-conforming" listed equipment which was sold, manufactured and/or installed for the public under the respective listings of UL-1023, UL-985, National Electrical Code and National Fire Alarm and Signaling Code.

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2) None of the control panel equipment tested complied with the required codes and standards extensively elaborated to in Mr. Zwirn's Expert Report. Consequently, all single data-bus control panels are non-conforming and require immediate recall and/or there needs to be a technical solution which can accomplish the task of ensuring strict compliance with each of the applicable and mandated codes and standards for household and commercial burglar and fire alarm control panels.

3) Failure to comply with the equipment manufacturer's specifications and the listings of the control panel violates the National Electrical Code. Until such time that all of the installed and/or manufactured control panels can be redesigned to actually be in compliance with each of the represented and referenced codes and standards as subsumed in the Zwirn Expert Report, the following steps need to be immediately taken:

   a. Authorities having jurisdiction across the country and around the world need to be put on notice immediately.

   b. The Consumer Product Safety Commission (CPSC) should be notified of the identified dangers of the non-conforming control panels.

   c. All of the affected control panels should be immediately corrected.

   d. All of the affected consumers and businesses where these control panels are installed should be put on notice that immediate corrective action is required since the control panels are non-conforming equipment.

4) None of these control panels can be deemed to be reliable or safe.

5) Non-conforming equipment substantially increases the risks of property loss, serious personal injury and/or death to occupants within the premises during an intrusion, fire, smoke and carbon monoxide emergency event.

6) A comprehensive and corrective action plan needs to be instituted immediately.

The recipient of this report is hereby prohibited from utilizing it for any purpose other than what it was intended for.

Respectfully submitted,

Merton Bunker, PE

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To Whom It May Concern:

I have reviewed Mr. Zwirn's demonstrative testing video of the Johnson Controls Power Series Pro Control Unit. In my opinion, Mr. Zwirn's testing demonstrates that the equipment does not comply with UL 985, UL 1023, and NFPA 72, *National Fire Alarm and Signaling Code®*.

In my opinion, the writings in the communications from both Johnson Controls, dated November 27, 2020, and from Underwriters Laboratories, Inc. (UL) dated December 18, 2020 respectively to Mr. Zwirn do not change the findings by Mr. Zwirn, in that he has opined that the Power Series Pro Control Unit is non-conforming and does not comply with UL standards and NFPA 72.

This opinion is based on the language found in the following referenced documents, included as Annex 1 of this letter.

- NFPA 72: Sections 29.10.7.5 and 29.10.7.6
- UL 985: Household Fire Warning System Units 6th Edition Sections
- UL 1023: Household Burglar-Alarm System Units, 6th and 7th Editions

UL 985, UL 1023, and NFPA 72 have similar language relating to faults on common system wiring. Non-fire alarm equipment on a combination system that is connected to the common wiring (e.g., the data bus or CORBUS) cannot prevent any supervision of the system or prevent alarm signal operation. Mr. Zwirn's video clearly shows the loss of alarm signal capabilities during a short circuit condition on the common data bus. Neither keypad functioned during the alarm condition and the alarm signal was not transmitted to the supervising station. In my opinion this is a violation of the standards in Annex 1 attached to this letter.

My expert opinions are based on my specialized education, skill, knowledge, training, and experience in Fire Protection Engineering and my involvement in NFPA 72 as an employee of the National Fire Protection Association (NFPA) and as staff liaison for NFPA 72. A current copy of my curriculum vitae is attached.

Finally, I rely on Mr. Zwirn's 43-page Expert report on the data-bus danger dated April 3, 2019 and my findings as set forth in my peer reviewed Expert report dated September 9, 2019.

The foregoing opinions are held to a reasonable degree of Professional, Engineering, UL and NFPA 72 certainty.

Respectfully submitted,

Merton Bunker, PE

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